

V1.0



Using a 32-bit motor driver chip and Field-Oriented Control (FOC), the RoboMaster C620 Brushless DC Motor Speed Controller enables precise control over motor torque.

Exclusively developed for the RoboMaster because of its Brushless DC Motor and C620 Brushless DC Motor Speed Controller, the M33000 Assisted Motor includes several subassemblies and a terminal board.

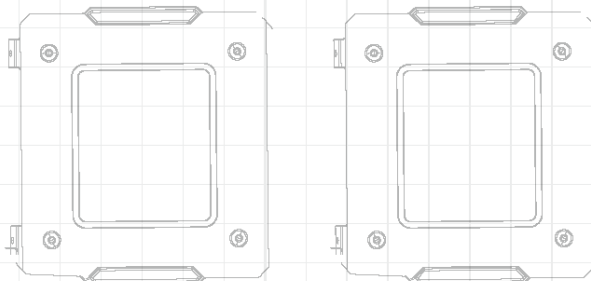
RoboMaster Speedometer Manual, RoboMaster User Manual, Introduction of RoboMaster System Website

See M33000 Assisted Motor include several subassemblies and terminal board, complete assembly system object for four independent motors.

ROBOMASTER 2022 UNIVERSITY TECHNICAL CHALLENGE

PARTICIPANT MANUAL

Prepared by the RoboMaster Organizing Committee
Released on October 2021



Statement

Participants are forbidden from engaging or participating in any actions determined by the RoboMaster Organizing Committee (hereinafter referred to as “the RMOC”) as involving public disputes or sensitive issues or causing offence to the public or certain social groups, or damaging the image of RoboMaster; otherwise, RMOC shall have the right to disqualify offending persons permanently from the competition.

Using this Manual

Legend

 Prohibitions	 Important notes	 Hints and tips	 Definitions and references
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Release Notes

Date	Version	Changes
2021.10.15	V1.0	First release

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1. Introduction

The RoboMaster Competition is initiated by DJI, serving as an academic exchange platform specially designed for technology enthusiasts from all over the world. Since its establishment in 2013, the RoboMaster has been committed to their mission – “honor the youths, empower ideas, serve young engineers across borders, and make their dreams come true”. The RoboMaster is also dedicated to tapping the potential of young talents with engineering background while widely passing on the beauty of science & technology as well as innovation to the public.

The RoboMaster University Technical Challenge (hereinafter referred to as “RMUT”) is sponsored by the Central Committee of the Communist Youth League of China and open to university/college students from all over the world. The RMUT believes that in-depth academic studies on a specific technical field are important for robotics development. It encourages all teams participating in the competition to explore the full potential of the technology and strive for perfection in robot building. Each team only needs to develop one robot for one challenge. This also enables great cost reduction in R&D, so that human resources and funds can be spared to focus on making more outstanding breakthroughs. The RMUT is undoubtedly a good opportunity for start-up teams to showcase their skills.

For the 2022 season, the RoboMaster University Technical Challenge consists of four components: Engineer Mining, Standard Racing and Smart Firing, Dart Targeting, and Hero Lob Shot.



For Standard Racing and Smart Firing, teams can compete in two robot categories: balance standard and regular standard. Teams are to apply, compete and be judged separately for either category.

2. Participation

Three types of teams may participate in the RoboMaster 2022 University Technical Challenge (hereinafter referred to as “RMUT 2022”): Teams from Mainland China, Teams from Hong Kong, Macau, Taiwan and Overseas, and Chinese and Foreign Joint Teams.



For the Chinese and Foreign Joint Teams, their competition categories and procedures will be determined according to the geographical locations of the colleges and universities.

2.1 Participating Teams

A participating team is required to meet the following requirements:

1. If any two or more teams do not meet any one requirement under the “Five Differences” Rule, they shall be treated as the same team.



The “Five Differences” Rule: Different team names, different team members, different supervisors, different affiliated institutions (college or other educational institutions), and different robots.

2. One team can sign up for more than one RoboMaster competition (RoboMaster University Championship, RoboMaster University League, RoboMaster University Technical Challenge and RoboMaster University AI Challenge).




Registrations have to meet the respective registration requirements of the different competitions.

3. The RMOC will deem a team participating in different competitions in the same season as the one and same group, in handling the various competition processes (including free material supply, material purchases, and participation support). A team cannot be broken up after completing registration for the season.

The below shows the definition, participation rights and entry procedures for each type of teams.

Table 2-1 Categories of participating teams

Teams from mainland China	
Definition	University or college participating teams that pass the registration review within the specified period, meet the relevant competition entry requirements and are geographically located in mainland China.
Participation Rights	Qualified for the 2020 Season competitions, awards application and promotion.

Participating Procedures	<ol style="list-style-type: none"> 1. Competition processes carried out in accordance with the standards for teams from mainland China. 2. Participate in the Regional Competition (for the mainland China division), and those who perform well will advance to the Final Tournament.
Teams from Hong Kong, Macau, Taiwan and overseas	
Definition	<p>University or college participating teams from Hong Kong, Macau, Taiwan and overseas that pass the registration review within the specified period and meet the relevant entry requirements.</p>
Participation Rights	<p>Qualified for the 2020 Season competitions, awards application and promotion.</p> <hr/> <p> Due to their different education systems, senior high school students are allowed to participate in teams from Hong Kong, Macau, Taiwan and overseas, but their number must not exceed 20% of the total number of team members.</p>
Participating Procedures	<ol style="list-style-type: none"> 1. Competition processes are carried out in accordance with the standards for teams from Hong Kong, Macau, Taiwan and overseas. 2. Directly participate in the Final Tournament.
Chinese and Foreign Joint Teams	
Definition	<p>Teams formed between a university or college from mainland China and a university or college from Hong Kong, Macau, Taiwan and overseas that pass the registration review within the specified period and meet the relevant entry requirements.</p>
Participation Rights	<p>Qualified for the 2020 Season competitions, awards application and promotion.</p>
Participating Procedures	<ol style="list-style-type: none"> 1. If the school's geographical location is in mainland China, its team is subject to the competition processes in accordance with the standards for teams from mainland China. 2. If the mainland school forms a team with teams whose universities are located in China Hong Kong, Macau, Taiwan and overseas, the team is subject to the entry procedures in accordance with the standards for teams from Hong Kong, Macau, Taiwan and overseas. The Joint Teams must meet the requirements stated in R4 of “2.3 Other Requirements” in order to participate in the competition.

2.2 Participants

The RoboMaster advocates teamwork and co-operation. To encourage the team members to take the initiative and undertake important roles within the team, the RoboMaster Organizing Committee (hereinafter referred to as

“RMOC”) will also award participants who have made great contributions to the competition. Examples of prizes include the Outstanding Captain Award and Outstanding Supervisor Award. For more details, please refer to “Appendix 2 About Award Selection”. Please refer to the table below for the roles and responsibilities of the participants:

Table2-2 Participants’ roles and responsibilities

Roles	Role Instructions	No. of Persons	Status	Responsibilities
<p>Supervisor</p>	<ul style="list-style-type: none"> ● The main person in charge of the team, responsible for the formation and management of the team ● Responsible for guiding the team in robot-building. ● Cannot serve as Advisor or team member at the same time 	<p>1-5</p>	<p>Faculty members of the team’s college or university who are qualified to teach or conduct scientific research and will have graduated by August 2022 (Evidence may be required to be shown on site)</p>	<ul style="list-style-type: none"> ● Responsible for the personal and property security of the team ● Coordinating on-campus resources, guide the team in developing project plans, controlling preparation progress, help the team successfully conclude the match ● During the matches, the Supervisor must actively cooperate with the work of the RMOC

Roles	Role Instructions	No. of Persons	Status	Responsibilities
Advisor	<ul style="list-style-type: none"> ● Team Advisor ● Cannot serve as Supervisor or team member at the same time 	0-5	Full-time junior college students, undergraduates, postgraduates, and doctoral degree candidates in colleges and universities, as well as engineers, researchers and faculty members working in enterprises, research institutions, or as freelancers	<ul style="list-style-type: none"> ● Provide guidance and support to the team on strategy, technology, management, etc. ● An advisor can undertake robot-building tasks and handle other competition-related matters.
Regular Members	<ul style="list-style-type: none"> ● Including Captain, Project Manager and General Member, see the table below for details ● They are not allowed to assume both the roles of Advisor and Supervisor. 	Please refer to “2.3 Other Requirements” for detailed requirements	Junior college students, undergraduate students, postgraduate students, and doctor students in full-time colleges and universities with proof of their identity between September 2021 and August 2022 (Evidence may be required to be shown on site).	See the table below for details

Table 2-3 Roles and Responsibilities of Regular Members

Roles	Role Instructions	Quantity	Responsibilities
Captain	<ul style="list-style-type: none"> ● Core team member, the team’s technical and tactical leader 	1	<ul style="list-style-type: none"> ● Responsible for the division of labor, overall planning and tactical arrangement and adjustment

Roles	Role Instructions	Quantity	Responsibilities
	<ul style="list-style-type: none"> The main liaison with the RMOc Cannot serve as Project Manager 		<ul style="list-style-type: none"> Attend Captains Meetings, represent the team in confirming match results, and participate in appeal processes and attend to any appeal during the competition Responsible for the legacy and development of the team after the competition
Project Manager	<ul style="list-style-type: none"> Core team member Overall manager of the project 	0-1	In charge of sorting out project tasks, coordinating fund, materials, personnel and other resources, helping establish sound team management regulations and institutions, planning and managing the overall project subjects (including goals, progress, costs, etc.)
General Member	Assumes none of the above roles	-	-

Table 2-4 Number of Team Members for Each Challenge

Challenge	Number of Regular Member	Number of Pit Crew Member
Engineer Mining	3-8	3+1
Standard Racing and Smart Firing	2-5	3+1
Standard Racing and Smart Firing (Balance Standard Robots)	2-5	3+1
Dart Targeting	2-5	4+1
Hero Lob Shot	3-8	4+1



Pit Crew Members: Regular Member and Supervisor who have registered for this Season and have been entered into the registration system, can walk into the Preparation Area and Competition Area.



One Supervisor should be included in the Pit Crew Member. Other team members are not allowed to be present at the competition site on behalf of the Supervisor.

2.3 Other Requirements

Participating teams must adhere to the following rules when forming their teams:

- R1. Any team participating in different competitions must use the same team name. A team's name must be in the format of "XXX Team", where "XXX" shall be the team's self-chosen name. The total length of the team name should not exceed 16 English letters or 8 Chinese characters. The team name must not include the school name or its abbreviation in Chinese/English, or such Chinese characters as "队", "团队" and "战队" which mean "team" in English, or other special symbols such as "*/-+". The team name must reflect the positive and pioneering spirit of the team and comply with relevant state laws and regulations. If the RMOC determines that a team's name does not align with the spirit of the competition, it has the right to require the team to change its name.
- R2. Each team must represent a university/college and meet the requirements for the team roles, number and identity of participants stated in "2.2 Participants".
- R3. In principle, each college or university is only allowed to have one qualified team for one competition (challenge). Institutions having multiple campuses in different cities, making it difficult for certain students to compete as a team, are allowed to form more than one campus-based teams provided it has been verified by the RMOC. If a school has more than one team applying for the competition, refer to the [Announcement on the List of Representative Teams for RoboMaster University Series 2022](#). The applicant must ensure that its registration information is complete and accurate, and that it will undertake the corresponding responsibilities. The applicant must bear all consequences caused by any missing or inaccurate information. For special circumstances, the applicant may contact the RMOC, which will handle the case based on actual circumstances. The RMOC reserves the right of final interpretation.
- R4. Any two to five schools that do not have their own individual teams can form an intercollegiate team.
- R4.1 Before establishing an Intercollegiate Team, members must consider all their respective circumstances and communicate with each other thoroughly about team planning. Any operating and R&D costs, personnel arrangements or disputes arising therefrom must be handled by the Intercollegiate Team itself, for which the RMOC bears no responsibility.
- R4.2 The Joint Teams are not allowed to be split after they've been established officially. They can only participate in the competition as Joint Teams. If an Intercollegiate Team is disbanded, the team will be deemed to have voluntarily dropped out of the competition.
- R4.3 The registered team name shall be "Intercollegiate Team" instead of "Team". An Intercollegiate Team is required to upload an Intercollegiate Team Statement issued by its college or university to the registration system. Refer to the registration system for the template of the Intercollegiate Team Statement.

R4.4 If more than 50% of the members in a Joint Team are regular members in team(s) from Hong Kong, Macau, Taiwan and overseas, this Joint Team shall be categorized as a Team from Hong Kong, Macau, Taiwan and Overseas and directly proceed to the Final Tournament. Otherwise, the Joint Team shall be categorized as a Team from Mainland China and must participate in the Regional Competition.

R5. In this season, one participant can only join one team for the competition.

- The RMOC will reject the registration of any team that does not meet any of R1-R4. The registration can be resubmitted after the team has amended it to meet the requirements.
- If any member of a team does not meet the identity requirements stated in R2, a Verbal Warning will be given to the team. If the Verbal Warning is ineffective, the highest penalty that can be given to the offending party is disqualification depending on the seriousness of the situation.
- If R5 is not met, the highest penalty that can be given to the offender and offending team is disqualification.

2.4 Platform for Communication and Q&A

The RMOC provides many Q&A channels as shown below. For further contact information and Q&A rules of the RMOC, please refer to RoboMaster Organizing Committee Official Contact Details and FAQ Rules.

Table 2-5 Platform for Communication and Q&A

Channel	Office Hours	Remarks
Forum: bbs.robomaster.com	Office hours: 10:30-12:30, 14:00-19:30 on weekdays	-
Email: robomaster@dji.com		-
Tel: 0755-36383255		Ext. 1-1
WeChat: rmsaiwu		When sending a friend request, please indicate "competition + college name + designation + name"
QQ: 2355418059		

3. Season Schedule



The following season schedule is for reference only. The specific time is subject to the latest announcement by the RMOC.

The RMUT 2022 consists of two schedules: the Online Schedule and the Offline Schedule. The RMOC recommends that each team formulate a preparation plan before the competition to estimate the human resources and funds needed in robot building. This may help the team to avoid wasting resources and funds as otherwise they may end up with excessive robot iterations due to a lack of experience.

A team has to complete the Registration and pass the Technical Assessment within the deadline in order to qualify for the competition. For more details on the Technical Assessment specifications, please refer to “Appendix 1 Technical Assessment”. Teams that have registered for the RMUT can enjoy discounts on certain products. For more details, please refer to the “[RoboMaster 2022 Instructions for Purchasing Materials](#)”.

Table 3-1 Online schedule

Schedule	Segment	Category	Entry Qualification
October 15, 2021, 18:00 - November 18, 2021, 18:00	Registration on Official Website	Teams from mainland China; teams from Hong Kong, Macau, Taiwan and overseas	Log in the RoboMaster website and complete the registration as required.
December 13, 2021, 18:00 - December 15, 2021, 18:00	Technical Assessment – Season Schedule	Teams from mainland China; teams from Hong Kong, Macau, Taiwan and overseas	Obtains permission to participate in the Referee System Exam
January 21, 2022, 18:00 - January 22, 2022, 18:00	Technical Assessment - Referee System Exam	Teams from mainland China; teams from Hong Kong, Macau, Taiwan and overseas	Obtains permission to participate in the Final Robot Assessment
April 4, 2022, 18:00 – April 6, 2022, 18:00		Teams from Mainland China	

Schedule	Segment	Category	Entry Qualification
June 6, 2022 18:00 – June 8 2022, 18:00	Technical Assessment - Final Robot Assessment	Teams from Hong Kong, Macau, Taiwan and overseas	Obtains permission to borrow the whole set of the Referee System and qualifies for the Regional Competition
April 12, 2022 18:00 – April 13 2022, 18:00	Competition Feedback	Teams from Mainland China	Teams may choose their divisions or accept the arrangements of the RMOC. The RMOC will decide which teams have priority in their choice of competition venue and are qualified for the offline competition, based on the region in which their college or university is located and their rankings.
June 15, 2022, 18:00 – June 16, 2022, 18:00		Teams from Hong Kong, Macau, Taiwan and overseas	
June 20, 2022, 18:00 – June 22, 2022, 18:00	Technical Assessment – Regional Competition Seasonal Summary	Teams from Mainland China that have failed to advance from the Regional Competition	Qualified for the Regional Competition certificates and prizes
August 22, 2022, 18:00 - August 24, 2022, 18:00	Technical Assessment – Final Tournament Seasonal Summary	Teams from Mainland China, and from Hong Kong, Macau, Taiwan and Overseas advancing from the Regional Competition	Receives the Final Tournament certificate and qualifies for prizes

Table 3-2 Offline schedule

Schedule	Item	Category	Eligibility
May - June 2022	Regional Competition	Teams from Mainland China	● Teams from mainland China that have passed the Final

Schedule	Item	Category	Eligibility
	(Mainland China division)		<p>Robot Assessment will qualify</p> <ul style="list-style-type: none"> ● The RMOC will decide which team has the prior right to choose their divisions based on their total Technical Assessment score rankings.
August 2022	Regional Competition (International division)	Teams from Hong Kong, Macau, Taiwan and overseas	Teams from Hong Kong, Macau, Taiwan and Overseas that have passed the Final Robot Assessment are qualified
August 2022	National Tournament	Teams from mainland China; teams from Hong Kong, Macau, Taiwan and overseas	Top-ranked teams in the Regional Competition will be qualified

4. Awards



- The names of the awards are subject to further adjustments and the actual certificates issued shall prevail.
- The number of prizes of each challenge is subject to changes according to the actual number of qualified teams. Technically, the number of the First Prize should account for no more than 10% of the total number of the teams participating in the competition. For the actual number, please pay attention to the latest version of Participant Manual released by the RMOC.
- Recipients of the Outstanding Contribution Awards and Organization Awards will be selected from all teams participating in the RoboMaster University Championship (RMUC) and RoboMaster University Technical Challenge (RMUT).

4.1 Final Tournament

The awards for the Final Tournament are as follows:

Table 4-1 Final Tournament Award

Prize	Ranking	Quantity	Awards
Final Tournament First Prize	Champion: First place	1/Challenge	<ul style="list-style-type: none"> ● Champion trophy ● First Prize Achievement Certificate ● Cash prize of RMB 5,000 (pre-tax)
	First Runner-Up: Second place	1/Challenge	<ul style="list-style-type: none"> ● First runner-up trophy ● First Prize Achievement Certificate ● Cash award of CNY 5,000 (pre-tax)
	Second Runner-Up: Third place	1/Challenge	<ul style="list-style-type: none"> ● Second runner-up trophy ● First Prize Achievement Certificate ● Cash prize of RMB 5,000 (pre-tax)
	Fourth to fifth place	2/Challenge	<ul style="list-style-type: none"> ● First Prize Achievement Certificate ● Cash prize of RMB 5,000 (pre-tax)

Prize	Ranking	Quantity	Awards
	-	Multiple	● First Prize Achievement Certificate
Final Tournament Second Prize	-	Multiple	Second Prize Achievement Certificate
Final Tournament Third Prize	-	Multiple	Third Prize Achievement Certificate

4.2 Regional Competition



The number of prizes and teams advancing to the Final Tournament of each challenge is subject to changes according to the actual number of qualified teams. Technically, the number of the First Prize should account for no more than 10% of the total number of the teams participating in the competition. For the actual number, please pay attention to the latest version of Participant Manual released by the RMOC.

Table 4-2 Regional Competition Award

Prize	Quantity	Awards
Regional Competition First Prize	5/Challenge	● First Prize Achievement Certificate ● Cash prize of RMB 3,000 (pre-tax)
	Multiple	● First Prize Achievement Certificate
Regional Competition Second Prize	Multiple	Second Prize Achievement Certificate
Regional Competition Third Prize	Multiple	Third Prize Achievement Certificate

4.3 Annual Technical Breakthrough Award



The winners of the Annual Technical Breakthrough Award must share their relevant robot types and seasonal summary as open-source content in accordance with the rules and specifications. Otherwise, the release of the cash prizes may be affected. The RMOC will add more Open Source Awards depending on the actual open source situation.

Table 4-3 Annual Technical Breakthrough Award

Prize	Quantity	Awards
First Prize	Maximum 1/Challenge	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 30,000 (pre-tax)
Second Prize	Maximum 1/Challenge	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 15,000 (pre-tax)
Third Prize	Maximum 3/Challenge	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 10,000 (pre-tax)

4.4 Open Source Award



- There is no fixed number of open source awards, and the RMOC will rank them according to the quality of the submitted projects. For example, if there are no open-source projects of an outstanding nature, no winner will be announced for the Open Source Grand Prize. But if there is more than one outstanding open-source project, the Grand Prize may be awarded to multiple winners.
- The top four teams in the Final Tournament must share their open-source content in accordance with the rules and specifications. Otherwise, the release of the cash prizes may be affected. The RMOC will add more Open Source Awards depending on the actual open source situation.

The setup of the Open Source Award is as follows. For details on the award criteria, please refer to “Appendix 2 About Award Selection”.

Table 4-4 Open Source Award

Prize	Quantity	Awards	Remarks
Open Source Grand Prize	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 100,000 (pre-tax) 	1. During the RM2022 season (Oct 15, 2021 to Aug 24, 2022), the core technologies or operation management approaches should be made open-source on RoboMaster forum and its official website, for the purposes of promoting technical development at the RoboMaster University Championship and the innovative culture and spirit of engineers.
Open Source First Prize	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 50,000 (pre-tax) 	
Open Source Second Prize	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● Cash prize of RMB 15,000 - 30,000 (pre-tax), awarded based on an overall assessment of the open-source materials 	

Prize	Quantity	Awards	Remarks
Open Source Third Prize	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 10,000 (pre-tax) 	
Open Source Outstanding Prize	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● Cash prize of RMB 2,000 - 5,000 (pre-tax), awarded based on an overall assessment of the open-source materials 	

4.5 Outstanding Contribution Awards



Outstanding Supervisor award recipients, Outstanding Captain award recipients, and Outstanding Project Manager award recipients are required to submit a personal work summary and experience description within one month after the award is announced and are obligated to participate in the sharing sessions and surveys conducted by the RMOC.

The setup of the Outstanding Contribution Awards is as follows. For details on the award criteria, please refer to “Appendix 2 About Award Selection”.

Table 4-5 Outstanding Contribution Awards

Prize	Quantity	Awards
Outstanding Supervisor	No more than 8 people in total for this season	<ul style="list-style-type: none"> ● Achievement certificates ● Cash prize of RMB 8,000 (pre-tax)
Outstanding Captain (Team)	Outstanding Captain (Team)	<ul style="list-style-type: none"> ● Achievement certificates ● Cash prize of RMB 5,000 (pre-tax)
Outstanding Project Manager	No more than 8 people in total for this season	<ul style="list-style-type: none"> ● Achievement certificates ● Cash prize of RMB 5,000 (pre-tax)
Outstanding Advisor	No more than 8 people in total for this season	<ul style="list-style-type: none"> ● Achievement certificates ● Cash prize of RMB 3,000 (pre-tax)

Prize	Quantity	Awards
Outstanding Volunteer	<ul style="list-style-type: none"> ● No more than 10 people per region ● No more than 15 people for the Final Tournament 	Achievement certificates

4.6 Organization Awards

Table 4-6 Organization Awards

Prize	Quantity	Awards
Competitive Spirit Award	No more than 5 people in total for this season	<ul style="list-style-type: none"> ● Achievement certificates ● Cash prize of RMB 5,000 (pre-tax)
Discipline Building Award	No more than 5 people in total for this season	<ul style="list-style-type: none"> ● Achievement certificates ● Cash prize of RMB 5,000 (pre-tax)
Supervisor with Outstanding Team Talent	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● The relevant points rewards and cash prizes specified in the Supervisor Recommendation System. ● Only applicable to Teams from Mainland China, and from Hong Kong, Macau, Taiwan
Rising Star Award	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● Special discount on the Standard toolkits
Best Season Schedule Award	Maximum 10 for this season, Maximum 5 in total	<ul style="list-style-type: none"> ● Achievement certificates ● The top two teams will receive a set of Standard Referee System (excluding the VTM module) worth RMB 5,033; teams ranked 3rd to 10th will receive one GM6020 brushless DC motor worth RMB 899 and one battery rack (compatible type) worth RMB 199.

Prize	Quantity	Awards
Cost Control Award	No more than 5 people in total for this season	<ul style="list-style-type: none"> ● Achievement certificates ● One GM6020 brushless DC motor worth RMB 899

4.7 Special Awards on Livox Lidar Application

The setup of the Special Awards on Livox Lidar Application is as follows. For details on the award criteria, please refer to “Appendix 2 About Award Selection”.

Table 4-7 Special Awards on Livox Lidar Application

Awards		Quantity	Prize
Livox Open Source Award	First prize	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 18,000 (pre-tax)
	Second prize	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 10,000 (pre-tax)
	Third prize	Multiple	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 5,000 (pre-tax)
	Outstanding Prize	Multiple	Achievement certificates
Livox Academic Incentive Award	First prize	No more than one	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 25,000 (pre-tax)
	Second prize	No more than two	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 12,000 (pre-tax)
	Third prize	No more than three	<ul style="list-style-type: none"> ● Achievement certificates ● RMB 6,000 (pre-tax)
Livox Use Cases Award	-	Multiple	RMB 2,000 (pre-tax)

Appendix 1 Technical Assessment

All teams participating in the RMUT 2022 must submit the materials requested for the Technical Assessment in accordance with the RMOc requirements by the deadline. For the schedules of the Technical Assessment for RMUT 2022, please refer to “Appendix 1 Technical Assessment”.

The purpose of the Technical Assessment is for the teams to demonstrate their technical skills and guiding them in their plans and preparations as well as development based on previous experience. It also offers an opportunity for team members to polish their skills including requirements analysis, budgeting, data analysis and report drafting. Participating teams are advised to take the Technical Assessment seriously and use the opportunity to demonstrate their strengths and skills.



ONES focus on developing enterprise-level R&D management tools and solutions. As a partner of RoboMaster, ONES provides all participating teams with product management matrixes for free in enterprise editions, including Project (for R&D project management and task coordination), Plan (for program, project portfolio management), Wiki (for document coordination and knowledge base management), TestCase (for use case testing and test plan management), and Pipeline (for pipeline management). These professional tools will offer support throughout the entire R&D life cycle, promoting ideal coordination in R&D, enhancing efficiency and ensuring the quality of the deliverables. The RMOc recommends that teams use ONES products during competition preparation to facilitate the Technical Assessment. To apply for the free RoboMaster Exclusive Space, please contact us via our event dedicated WeChat account at: rmsaiwu.

The Technical Assessment of RMUT 2022 mainly consists of four parts: Competition Planning, Referee System Exam, Final Robot Assessment and Seasonal Summary.



The latest tasks and requirements relating to each section of the Technical Assessment shall be based on [announcements on the official website](#).

Submission Specifications

Please find the specifications for the submissions involving video clips as well as other forms of documents for the Technical Assessment:

Appendix Table 1 Submission Specifications

Document Type	Specification
Text	<ul style="list-style-type: none"> ● Format: PDF; ● Font: SimSun (Chinese) or Times New Roman (English), 12 pt; ● Line spacing: 1.5; ● File name format: University/College Name + Team Name + File Name.
Table/Form	<ul style="list-style-type: none"> ● Format: Excel; ● Font: SimSun (Chinese) or Times New Roman (English), 11 pt; ● Wrap Text, AutoFit Row Height and Column Width; ● Alignment: Vertical center, horizontal left or center, unless otherwise specially requested.
Slides	<ul style="list-style-type: none"> ● Format: PowerPoint; ● Font: SimSun (Chinese) or Times New Roman (English), 24 pt; ● Each slide must have a title that summarizes the content; ● Display all content in Normal View and avoid using animations that requires to play the slides; ● The file size should be no larger than 300M.
Video	<ul style="list-style-type: none"> ● Upload the video to the specified website and provide the video link; ● The video's resolution must be at least 720p; ● Subtitles or commentaries should be included to explain each process in the video; ● Only relevant content should be shown, with the video well-paced and its duration kept within the maximum length.

A. Season Schedule

- Chance for submission: Once
- Passing Criteria: Scored 45% or more
- Content to be submitted and requirements: PDF document



Teams participating in multiple RMUT challenges are required to create and submit multiple season schedules. The team only needs to submit the proposed frameworks with the content serving as an introductory description. Each team may adjust and modify the ideas and form of their season schedule as required by the circumstances, as long as the schedule ultimately reflects the desired goals, technical solution and the rationale behind the solution. The analysis for each segment must show the calculations and the processes of arriving at the theoretically optimal solutions.

Appendix Table 2 Season Schedule Assessment Requirements

Content	Section	Content	Score
Rules-based technical point analysis		Conduct detailed technical point analysis based on the competition rules for the season, and fully understand the technical breakthrough points sought to be achieved through the missions.	10
Technical solution analysis	Robotic structure solution	Analyze and derive the technical indicators, and deduce and calculate the theoretical limits for each module in accordance with mission requirements, and show the process and data of the analysis and deduction; Anticipate potential issues that may be inconsistent with theory and the schedule, and their causes, and how they can be proven and improved on.	65
	Hardware solution	Confirm the models of the main chip and key sensors based on the team’s funds, and explain the reasons for the choice of the models with the support of data analysis. Complete hardware framework designs as required.	
	Software solution	<ul style="list-style-type: none"> ● Design the software system architecture in accordance with the functions of the solution, and explain the design rationale with the support of data analysis; ● Assess various needs such as computing power, flash memory size, and aesthetic design, assist team members in charge of hardware in selecting models or designing suitable hardware platforms; 	

Content	Section	Content	Score
		<ul style="list-style-type: none"> ● Design the communication links between the modules in a way that addresses the complexity of the competition environment and ensures communication reliability and stability; ● Complete software testing and design a debugging plan; ● Decide whether to use open-source software solutions depending on the complexity of the functions. If there are multiple solutions, include a comparative analysis and optimize the functions based on the superior solution. 	
	Algorithmic solution	<ul style="list-style-type: none"> ● Choose the appropriate algorithmic solution in accordance with the mission goals, ensure the algorithm is well-suited, and have an in-depth understanding and description of the rationale for choosing the algorithm; ● Describe how the algorithm test environment will be built, to ensure the robots' performance on the battlefield. 	
	Test solution	<ul style="list-style-type: none"> ● Team members in the software, hardware and mechanical segments must design the test case together based on the functions, and describe how the test interface will be designed in the development process; ● Understand and apply certain testing methodology, such as: black-box testing, continuous integration, stress testing, etc. ● Complete functional logic, performance test analysis, etc. 	
Progress schedule		<p>Create a reasonable schedule covering the season and break down large goals into smaller ones. Test and achieve breakthroughs first on technical points about which the team is least confident based on previous technical analysis, and set a timeline for result verifications. Avoid submitting all content at the final point of the schedule.</p>	10

Content	Section	Content	Score
Manpower arrangements		Select suitable team members for each solution, assign roles based on each person's interest and technical expertise, confirm the time and energy each member is able to invest, and put in place backup members.	5
Budget analysis		Understand the process and costs of building the robots based on the above design plan, decide on the hardware production method and costs, and estimate the iterations required to achieve the goals. Set the budget and check the team's spending against it as required by the circumstances.	5
References for the technical solution analysis		List the open-source information of other teams and theoretical analysis papers and sources referred to in making this plan.	5

B. Referee System Exam

Exam Content: Latest "[RoboMaster Referee System User Manual](#)" and documents related to the Referee System.

C. Final Robot Assessment

- Chance for submission: Once
- Passing Criteria: All teams will be ranked by their total scores. The teams which have completed the mandatory missions and whose progress is ranked among the top will qualify.
- Content to be submitted and requirements: Video and PowerPoint file. to show the plan and progress of each robot category with proof and evidence including video clips, screenshots of the progress plan, screenshots of the drawings, debugging records, etc. Please refer to "[RMU 2022 Progress Assessment Criteria](#)".

D. Team Season Summary

- Chance for submission: Once
- Passing Criteria: Scored 45% or more
- Submission requirement: PDF file



Teams participating in multiple RMUT challenges are required to create and submit multiple seasonal summaries. To update and optimize based on the season schedule. To focus on analyzing the existing issues and their causes for each segment, and to explain the analytical process and how the issues were proven, and describe how improvements or enhancements were made.

Appendix Table 3 Seasonal Summary Assessment Requirement

Content	Section	Content	Score
Post-mortem of the rules-based technical points		Conduct detailed technical point analysis based on the competition rules for the season, and fully understand the technical breakthrough points sought to be achieved through the missions.	10
Post-mortem of the technical solution	Robotic structure solution	<ul style="list-style-type: none"> ● Display and description of the overall effect ● Description of the creative structural design 	65
	Hardware solution	<ul style="list-style-type: none"> ● Block diagram of the final hardware version ● Description of the self-designed hardware circuits 	
	Software solution	<ul style="list-style-type: none"> ● Description of the software development and debugging environment ● Software system architecture ● Detailed description of the key functional modules 	
	Algorithmic solution	<ul style="list-style-type: none"> ● Description of the algorithms for each key technical point 	
	Test solution	<ul style="list-style-type: none"> ● Description of core test cases ● Summary of test data 	
Post-mortem of the progress schedule		Conduct a post-mortem of the R&D progress for the season based on the season schedule, and describe how the team actually managed the R&D progress.	10
Post-mortem of the manpower arrangements		Conduct a post-mortem of each simulated manpower scenario based on the season schedule, measured in “man-hour”.	5

Content	Section	Content	Score
	Budget post-mortem	<ul style="list-style-type: none"> ● Conduct a post-mortem of expenditures based on the season schedule, and outline the team's expenses, budget and spent amount for the season. ● Analyze cost reasonableness and identify any possibility for cost reduction. Analyze in depth the cases of cost control and management to conclude the lessons to be learned. ● Report the progress of cost control capability development and put forward a reasonable plan for the next season. 	5
	References for the technical solution	List down the open-source information of other teams and other theoretical analysis papers and sources referred to during the competition.	5

Appendix 2 About Award Selection

Individual winners or team winners of each award are required to submit their competition experience relevant to the award.

A. Annual Technical Breakthrough Award

Appendix Table 4 Annual Technical Breakthrough Award Selection Criteria

Prize	Selection Criteria	Selection Method
Annual Technical Breakthrough Award	<ul style="list-style-type: none"> Teams that recorded outstanding results in challenges and achieved technical innovation and breakthroughs Teams with high scores for their season schedule and seasonal summary, which are instructive for other teams in achieving breakthroughs in the challenge. 	The RMOC will select the first, second and third-prize winners from the teams based on their results rankings and the total scores for their season schedule and seasonal summary, along with their performance in the competition.

B. Open Source Award

a) Selection Criteria

The RMOC will score the open source materials according to the following two criteria: basic format and content. For the selection criteria, see “[RoboMaster University Series Open Source Awards Selection Criteria](#)”.

Appendix Table 5 Open Source Award

Value	Prize
(95, 100]	Open Source Grand Prize
(90, 95]	Open Source First Prize
(85, 90]	Open Source Second Prize
(80, 85]	Open Source Third Prize
(70, 80]	Open Source Outstanding Prize

b) Application Process

- Teams from Mainland China are required to upload their open-source files to the relevant section in “Forum - Share technical/operational content”, while Teams from Hong Kong, Macau, Taiwan and Overseas should send their files to robomaster@dji.com, and name their files in this format: RM2022 + college name + team name + open-source content type + content description

2. Teams are required to complete the “RM2022 Award Application Form (Open Source)” (to be released).
3. The RMOC will assess and select the winners based on the application forms and quality of the open-source content submitted by the teams.



1. The engineering processes involved in the software segment must be uploaded to github and set as public.
2. The engineering files in the mechanical and hardware direction need to be uploaded to the Baidu network disk.

C.Outstanding Contribution Awards

Appendix Table 6 Outstanding Contribution Awards Selection Criteria

Prize	Selection Criteria	Selection Method
Outstanding Supervisor	<ul style="list-style-type: none"> ● The team displays a good competitive spirit, with no serious violations of competition rules and proper standards of conduct. ● Guides the student team and instills team culture, displays a high sense of responsibility, is caring towards each team member, cares about the growth and development of students in the field of competition, and is deeply revered by said students ● The awards aim to open up employment opportunities for outstanding team members. The CVs of the nominated talent need to be submitted. 	<ol style="list-style-type: none"> 1. The candidates fill in the “RoboMaster 2022 Outstanding Supervisor Application Form” to proceed with the application 2. After the application is submitted, the RMOC will select the winners according the Application Form
Outstanding Captain	<ul style="list-style-type: none"> ● The team displays a good competitive spirit, with no serious violations of competition rules and proper standards of conduct. ● The Captain’s team actively cooperates with the RMOC and is willing to share knowledge, create a good communication atmosphere in the team circle; ensure the official information access rate within the team; completes the participation process on time 	<ul style="list-style-type: none"> ● Participates in Captains’ discussions, where the views shared by the Captain in the discussions are endorsed by the majority. Extra points are given to Captains receiving the top three highest votes after each discussion. ● Performance level:

Prize	Selection Criteria	Selection Method
	<ul style="list-style-type: none"> Compared to the past season, their team remains at the same level or have made progress in terms of the final result grade 	<ol style="list-style-type: none"> Regional Competition Third Prize Regional Competition Second Prize/Final Tournament Third Prize Final Tournament Second Prize Final Tournament First Prize
<p>Outstanding Project Manager</p>	<ul style="list-style-type: none"> The team displays a good competitive spirit, with no serious violations of competition rules and proper standards of conduct. Employs good project management methods, controls the overall progress of the project, comprehensively considers R&D costs, work safety, etc., and comprehensively manages the whole work. 	<ul style="list-style-type: none"> Participates in Captains' discussions, where the views shared by the Captain in the discussions are endorsed by the majority. Extra points are given to Captains receiving the top three highest votes after each discussion. Project management assessment reports are submitted on time, with active organization of team management tasks, contributing to an increase in the team's management standards. Selected according to the Project Manager's assessment score ranking
<p>Outstanding Advisor</p>	<ul style="list-style-type: none"> The team displays a good competitive spirit, with no serious violations of competition rules and proper standards of conduct. 	<ol style="list-style-type: none"> The candidates fill in the "RoboMaster 2022 Outstanding Advisor Application Form" to proceed with the application

Prize	Selection Criteria	Selection Method
	<ul style="list-style-type: none"> In the aspects of technological innovation, tactical design, team management, team building, etc., the advisor provides constructive and practical suggestions to the team, and provides guidance and support to the team in strategy, technology and management. 	<p>2. After the application is submitted, the RMOC will select the winners according the Application Form</p>
Outstanding Volunteer	<ul style="list-style-type: none"> Those who have participated in the voluntary work; understand, respect and love the RoboMaster; and actively co-operate with RMOC The volunteer is diligent and pragmatic, displays teamwork spirit, and shows outstanding performance in volunteer work Displays no dereliction of duty, misconduct, or major work mistakes 	<p>Nomination is done by the person in charge of the RMOC, and selection is then made according to the nomination materials</p>

D.Organization Awards

Appendix Table 7 Organization Awards Selection Criteria

Prize	Selection Criteria	Selection Method
Competitive Spirit Award	<ul style="list-style-type: none"> The team displays a good competitive spirit, with no serious violations of competition rules and proper standards of conduct. The team is active in forums, WeChat groups, etc., and interacts well with the RMOC, volunteers, and other teams The team is helpful, active and an open source of information for others, enthusiastically sharing their experiences and willing to provide resources to other teams 	<ul style="list-style-type: none"> Selections to be made according to the feedback given by the staff of the RMOC, other teams, and volunteers of the competition. Teams with more positive feedback from the RMOC staff, other teams, and event volunteers will be given priority

Prize	Selection Criteria	Selection Method
<p>Discipline Building Award</p>	<ul style="list-style-type: none"> ● The team displays a good competitive spirit, with no serious violations of competition rules and proper standards of conduct. ● The team or its lab has extensive robotics-related competition experience. ● The team or its lab has extensive patents, publications or scientific research records in the field of robotics. ● The team or its lab is an abundant source of information on entrepreneurship, employment and further education. ● The team’s supervisor establishes relevant RoboMaster courses or incorporates subject knowledge from RoboMaster into the curriculum, or creates a RoboMaster research lab, etc. 	<ul style="list-style-type: none"> ● The selection will be made by the RMOC based on the various team information collected relating to each aspect. ● Preference is given to teams with abundant information and that perform well in multiple aspects.
<p>Supervisor with Outstanding Team Talent</p>	<p>The supervisor recommends outstanding talent to DJI (including but not limited to team members and other personnel who are still studying in or have graduated at the colleges and universities), participates in DJI’s social recruitment, and recommends an exceptional number of talent.</p>	<ul style="list-style-type: none"> ● The supervisor who recommends an exceptional number of talent for the year in accordance with the process specified in the “RoboMaster University Series Supervisor Recommendation System”. ● Only applicable to Teams from Mainland China, and from Hong Kong, Macau, Taiwan
<p>Cost Control Award</p>	<ul style="list-style-type: none"> ● Cost data is clear and complete and can reflect the result of cost overview or cost control ● High executability of the cost control scheme and methods. 	<ul style="list-style-type: none"> ● Score of cost relevant content in each Technical Assessment section ● The effectiveness of open sourcing cost control method (the participation of the selection of Cost Control Award need to be illustrated separately when applying for Open Source

Prize	Selection Criteria	Selection Method
	<ul style="list-style-type: none"> ● During the match preparation stage, actively open source the effective and replicable cost control method and case 	Award)
Rising Star Award	<ul style="list-style-type: none"> ● Teams that were not able to qualify for the University Championship or the University Technical Challenge in the 2018 and 2019 seasons, but have successfully entered the Regional Competition this season ● Those who have not received any Standard robot or Standard toolkits in the 2019 and 2020 seasons, as gifts to the universities/colleges participating in the competition for the first time 	Selection is made based on registration information.
Best Season Schedule Award	<p>Make the Season Schedule of the current season open source, and the score of this section in Technical Assessment ranks in top 10 among all open source teams</p>	<p>The RMOC will collect the open source materials from the RoboMaster forum and make the selection according to rankings</p> <p>*Open source post title: [Season Schedule + College Name Team Name + RM2022 Season Schedule Open Source]</p>

E. Special Awards on Livox Lidar Application

Appendix Table 8 Special Awards on Livox Lidar Application

Awards	Criteria
Livox Open Source Award	<ul style="list-style-type: none"> ● During the RMUC 2022 season, the core technologies or operation management approaches on Livox lidar applications should be made open-source through well-known channels/ platforms. ● Detailed assessment will be announced later.
Livox Academic Incentive Award	<ul style="list-style-type: none"> ● The judging criteria will be based on aspects such as academic educational and practical value.

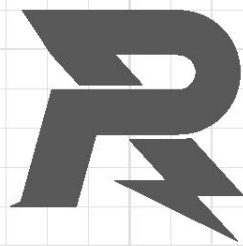
Awards	Criteria
	<ul style="list-style-type: none">● Detailed assssment will be annouced late.

Appendix 3 Safety Instruction

Every team member participating in the RoboMaster must fully understand and accept that safety is the prerequisite for the sustainable development of the RoboMaster. In order to protect the rights and interests of all team members and the event organizers, and according to relevant laws and regulations, all team members who have registered for any event or competition related to RoboMaster will be deemed to have acknowledged and agreed to abide by the following safety terms:

1. All team members who have registered to participate in the RoboMaster must confirm that they have full capacity for civil conduct and they are able to build and operate robots independently. They must also make sure that they have read in detail the Registration Guide, Competition Regulations among other important documents stating the rules and regulations of the competition, before starting to use any products by SZ DJI Technology Co., Ltd. to build robots.
2. During the competition, all participants should make sure that their actions including the creation, testing, and use of robots will not cause any injury or damage to his or her teammates, members of the opposing teams, staff, audience, equipment, or the competition venue.
3. All teams must ensure that the structural design of their robots will not hinder safety inspection during Pre-match Inspection, and agree to fully cooperate with the Pre-match Inspection carried out by RoboMaster's organizers.
4. All teams guarantee that they will not use any internal combustion engines, explosives, or high-pressure gas as working gas, or any dangerous materials.
5. During any stage of the R&D, preparation or competition period, all team members must be fully aware of any potential safety issues, and the team's Supervisor is responsible for instructing and supervising the team on safety issues.
6. All teams must guarantee the safety of all robots. This includes ensuring the projectile launchers installed on robots are safe, and that they will not cause any harm either directly or indirectly to any Operator, referee, staff member or audience member.
7. All teams will take sufficient and necessary safety measures during the R&D, training and competition periods regarding any hazardous situations that may occur. These include but are not limited to: preventing the control system from becoming unstable; anticipating every operation step prior to execution to avoid errors or collisions between team members or between robots and team members; prohibiting team members from engaging in solo training and making sure personnel are available as emergency responders to any situation; wearing goggles and helmets; applying the spotlight lock function and adding an emergency stop function other measures in a robot during debugging.

8. Teams will be held responsible for all accidents and losses resulting from the technical faults of robots, loss of control of UAVs or any other unexpected circumstances.
9. The materials bought from or provided by the organizer SZ DJI Technology Co., Ltd., such as batteries and the Referee System, must be used in accordance with their instructions. SZ DJI Technology Co., Ltd. will not be held responsible for any injuries that arise from improper use of these materials. Teams will be held responsible for any injuries caused to their own members or any third party and for any property loss arising from creating and operating any robots.
10. All team members must remain in strict compliance with the laws and regulations of the country or region. All team members pledge that their robots will only be used for the RoboMaster competitions and that their robots will not be illegally modified or used for any illicit purpose.



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