



INTERNATIONAL EFFICIENCY CHALLENGE ELECTRIC VEHICLE SPECIFICATION

2024

VERSIONS

Version	Date	Description	Changes
Y20.V1.0	December 16, 2023		20. EC Electric Vehicle Races; First Release
Y20.V2.0	January 3, 2024		A.4. Progress Report D.1.1. Track Information: TÜBİTAK Gebze Campus D.1.2. Electromobile Final Race D.1.3. Hydromobile Final Race D.1.5. Number and Time of Laps are updated
Y20.V3.0	January 15, 2024		A.1. Aim and Scope of the Competition is updated
Y20.V4.0	January 23, 2024		A.2. Event Schedule A.6.a. Dynamic Driving Test Video A.6.b. Brake Test Video C.6.1. Vehicle Measurements C.6.3. Door C.7.4. Safety Belts C.7.7. Roll Bars and Roll Cages C.7.8. Chassis D.1.2. Electromobile Final Race D.1.3. Hydromobile Final Race D.2. Race Week Appendix 2: Penalty List Appendix 3: Awards List are updated
Y20.V5.0	February 20, 2024		A.2. Event Schedule A.4. Progress Report A.5. Technical Design Report C.2. Electrical Safety D.1.1. Track Information: TÜBİTAK Gebze Campus D.1.4. Drag Race Appendix 2: Penalty List are updated
Y20.V6.0	March 5, 2024		A.2. Event Schedule C.6.5. Wheels Appendix 2: Penalty List are updated
Y20.V7.0	March 25, 2024		A.2. Event Schedule Appendix 2: Penalty List are updated

Dear Participants,

As you know, our competition started in 2005 under the name of Solar Powered Vehicle Races, with a unique wave of excitement that highlighted sustainable energy and technology. Then, in 2007, we included hydrogen energy in our competition, focusing on energy efficiency and environmentally friendly technologies, and added the Hydromobile Category. By the time we reached 2014, the Battery Electric Vehicle Category (Electromobile) was introduced, and the diversification of energy sources began. Following this development, solar-powered vehicles were replaced by electric-powered vehicles. Emphasizing the importance of electric vehicles, awareness was raised. In the same year, with an emphasis on domestic, the role of domestic production and design was strengthened in the races.

The international applications that started in 2016 under the name "International Efficiency Challenge Electric Vehicle" have allowed the competition to reach a wider global audience. In 2018, the Autonomous Vehicle Category was added, which not only focuses on energy efficiency but also highlights advancements in automation and artificial intelligence. The same year, the concept of domestic production was emphasized, and a rule was introduced requiring the electric and hydro teams to design and produce four vehicle components themselves.

In 2019, we started organizing our competition under the umbrella of TEKNOFEST for the first time as part of the National Technology Initiative. We also added the high school category to our competition and encouraged younger talents interested in science to participate.

In 2023, we designed our racing circuit according to the innovations of the modern age and arranged it to be suitable for the design of urban two-seater vehicles. We accelerated the transition to the urban concept with the loading and unloading task and included acceleration in the race. Highlighting the importance of sustainable transportation and urban mobility and making positive contributions to the future by promoting not only technological advancements but also environmentally friendly efficiency in races, continues to be one of our priorities today.

As a competition that has made a name for itself as an influential event for generations, our competition was first organized in 2005 with only 10 vehicles taking their place on the track. Looking at where we are today, we observe that the number of applications has been increasing every year, breaking records.

The popularity and prevalence of electric vehicle technology are increasing day by day. At this point, it becomes necessary to make updates in order to keep up with the latest developments in the industry in a sustainable manner.

In order for our valuable contestants to have the necessary skills to meet the needs of the industry, we are fulfilling our responsibilities and emphasizing the importance of mutual interaction with the private sector, which is one of the most effective ways to achieve this. In this regard, we aim to provide you with different perspectives through new updates and make efforts to facilitate your development. By encouraging teams to obtain reference letters for domestically developed parts and increasing cooperation with private sector companies, we support innovation. Through all of this, our aim is to enable you, our valuable young people, to achieve more realistic results.

Domestic and nationalism always continue to be one of our top priorities, but it is of great importance to proceed in a controlled manner without disregarding the realities of the industry. With the new updates, we reward the indigenization category by managing it through an internal evaluation process without affecting performance results. This approach aims to promote domestic design and production while keeping the competition alive. This year, by allowing teams the freedom to use ready-made parts, we will support vehicle designs that can compete under real conditions. With the new steps taken, Electric Vehicle Races will continue to progress proactively without compromising its dynamism, by going beyond being just an event and continuing to be a platform that supports innovation, collaboration, and sustainable development.

With this vision, I would like to remind you to review our updated specification in detail and to carry out your preparations within the framework of the rules stated in the specification. You can always contact us via email for any questions or suggestions regarding the specification.

As part of the National Technology Initiative, I would like to thank you, our valuable young individuals, for your efforts in bringing domestic and national technologies to our country. On behalf of our institution and our country, I wish you success.

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DEFINITIONS

Advisor: Academic person who advises the team within the scope of the competition or person who has knowledge and experience about electric vehicles,

Jury: The Advisory and Assessment Committee was established by TÜBİTAK to benefit from the opinions of its members and to execute the International Efficiency Challenge Electric Vehicle.

Announcement: Announcement text that defines the activity topic, scope, application conditions, support amounts, competition calendar, and special issues determined by TÜBİTAK.

Ethical Violation: Unethical situations such as plagiarism etc., (for example, quoting from another team's report/video or the same/very similar reports/videos of 2 or more teams),

Team Captain: The person who is determined by the team and who is responsible for communication with TÜBİTAK, who will take responsibility for the administrative and financial issues of the team, and who is obliged to be in the competition area during the registration and technical inspections during the competition week.

Team Member: Each person who takes an active role in the team and registered in the KYS,

Team: The group consisting of the team captain, assistant captain, and other team members.

TEKNOFEST: Türkiye's first and only Aerospace and Technology Festival organized with the participation of many institutions playing a critical role in developing national technology in Türkiye.

TÜBİTAK: The Scientific and Technological Research Council of Türkiye.

A. APPLICATION PROCESS AND STAGES

A.1. Aim and Scope of the Competition

- The Efficiency Challenge Electric Vehicle Races, organized by TÜBİTAK since 2005, aims to create awareness among associate, undergraduate, and graduate students about alternative and clean energy sources, provide students with technical, professional, and teamwork experience, and cultivate human resources for the development of electric vehicles in our country.
- The competition is organized by TÜBİTAK Science and Society Presidency and TÜBİTAK Rail Transportation Technologies Institute (RUTE) within the scope of TEKNOFEST.
- The Rules covers the rules, procedures and obligations of the race to be organized.

A.2. Event Schedule

- The timeline of activities related to this year's competition is provided in Table 1.
- TÜBİTAK has the right and authority to organize and modify the relevant activity dates.

Table 1. Event schedule.

Activity	Date
Application Dates	December 16, 2023-February 29, 2024
Progress Report Deadline	March 22, 2024
Announcement of Progress Report Results	April 15, 2024
Loading and Sending the Consent and Commitment Letter	April 15-19, 2024
Date for Transferring Support to Teams	April 22-26, 2024
Deadline for Teams to Withdraw and Member Changes	July 5, 2024
Submission of Technical Design Reports	July 5, 2024
Sending Dynamic Driving and Brake Test Videos	July 5, 2024
Announcement of Technical Design Report Results	July 21, 2024
Race Week	August-September, 2024
TEKNOFEST Vehicle Exhibition and Award Ceremony	August-September, 2024

A.3. Application Process

- Undergraduate, graduate and doctoral students from Türkiye and abroad can participate in the competition as a team.
- The team consists of the team captain, advisor, if any, and members. The application is made by the team captain.

- The team captain registers through the system during the application dates. If available, they correctly and completely register the advisor and/or team members. Additionally, they send invitations to the advisor and members' emails. The invited member accepts the invitation by logging into the application system and completes the registration in the "my team information" section. Otherwise, the registration will not be completed. No printed documents are required from the teams in the application.
- In teams, team captain registration is mandatory, while advisor registration is not mandatory. An academic or an expert in the field can serve as an advisor.
- Teams should consist of a minimum of five (5) and a maximum of twenty-five (25) people, including the team captain and, if any, the advisor.
- Teams may consist of different university students. The team captain provides the coordination and necessary communication.
- All correspondence with TÜBİTAK is conducted by the team captain. The team captain should be selected as the communication officer in the application system. Throughout the competition process, all notifications and information from TÜBİTAK and TEKNOFEST will be communicated to the communication officer (team captain).
- The race is organized in two categories as Electromobile and Hydromobile. Teams can only apply to one category. It is not possible to change the category after the application period.
- Team captain change cannot be made unless there are compelling reasons. In cases of compelling reasons, however, a change can be made. Compelling reasons include:
 - Team captain change is done through the application system before transferring the preparation support.
 - After the transfer of preparation support, a petition for changing the team captain (according to the example published on teknofest.org) is prepared along with a delivery report and a new commitment letter. The report includes details such as vehicle information, invoices, and the amount of support. The petition and the report (according to the example published on www.teknofest.org) are signed by the current and new team captains, respectively. If there are any invoices related to support usage and the remaining amount transferred to the new team captain, a bank receipt is handed over to the new team captain. The scanned version of the petition, delivery report, and commitment letter should be sent to eculuslararasi@tubitak.gov.tr, while the signed copies should be sent to TÜBİTAK RUTE, Barış Mah. Dr. Zeki Acar Cad. No:1, P.K. 5, 41470 Gebze/KOCAELİ. No action will be taken for incomplete, incorrect, or unsigned documents. The change request is made through the system after all the documents are approved by the Directorate.
- Applications are made online via <https://www.t3kys.com> system.

- If there are multiple applications from the same advisor/team captain in the application system, the last application will be considered for evaluation based on the upload deadline. Previous applications will be eliminated from the system without evaluation.
- Participants who have completed the team formation process should apply for the competition that is suitable for their work.
- All team members, including the team captain, must be students (excluding the advisor) on the application date. If it is determined otherwise, the student will be disqualified from the competition. Students who are graduating during the competition week can still participate in the competition.
- The number of members invited to the TEKNOFEST exhibition area and award ceremony can be limited. In case of limitation, teams will be informed.
- It is mandatory to have a driver and a reserve driver in the team. Any member of a team, including the team captain, can be a driver/reserve driver. If there is an advisor in the team, he cannot act as a driver/reserve driver.
- In teams, the team captain, members, and if available, the advisor/consultant teacher cannot serve as team captains for multiple teams or be members or advisors.
- A student cannot be a member of multiple teams. A member of one team cannot be a driver for another team.
- The follow-up of the processes (application, report upload, forms to be filled, etc.) is the duty of the communication officer (team captain), and TÜBİTAK or TEKNOFEST is not responsible for delays and/or disruptions caused by the communication officer (team captain).
- E-mails with administrative and financial questions about the team should be sent by the team captain. Other members in teams can only send e-mails on technical issues.
- The team name cannot be used by another team. TÜBİTAK may request name change from teams applying with the same team names. Applications cannot be made with the same team name in both Electromobile and Hydromobile categories. Team names should not exceed 10 characters.
- All the responsibility of the students in the preparation works and in the race area, including the application registration, belongs to the team captain.
- The communication officer (team captain in the international category) should request a parental/guardian consent form signed by all members under the age of 18. These consent forms are collected and stored by the communication officer. They are not sent to the relevant Directorate.
- Member changes can be made through the application system at <https://www.t3kys.com>. After the deadline for notifying the withdrawal of teams specified in the competition calendar, member changes can only be made due to force majeure. If a member change is made after this date, the accommodation and

transportation of the respective member will be the responsibility of the team, and no adjustments/updates will be made by us.

- During the race week, wet-signed "responsibility undertaking forms" will be requested from each team member during the registration process at the race venue. The relevant document will be provided to the teams prior to the race.

A.4. Progress Report

- Progress report is the report that is required to contain explanations about what has been done and will be done about the vehicle. The photos of the vehicle from inside and outside may be placed in this report. It is the responsibility of the team captain to organize the preparation of the report. Also, it is an obligation to prepare the report according to required format.
- Progress report preparation guide and report format will be published at www.teknofest.org.
- The progress report may be prepared in Turkish or English. It is an obligation to prepare the report in only one (1) language.
- If a team is using the Turkish language, it should avoid foreign language equivalents unless there are commonly used Turkish terms for domain-specific concepts. However, if there are different Turkish uses of the concept, the team can act according to personal preference; the equivalent term in the original language can be indicated in parentheses where it first appears in the text, and only the Turkish term should be used thereafter.
- The report must be uploaded to the application system in PDF format with a maximum size of 60 MB between the stated dates. If the report is not uploaded to the system between the stated dates, the team will be eliminated from the race.
- The report must be prepared in A4 format, 12 type size, Arial, with 1.15 line spacing and bottom-top and side edges are with 2.5 cm; Including cover page, the table of contents, bibliography and appendices, a progress report cannot exceed 75 pages.
- Using cover page, table of contents and bibliography in the progress report is not obligatory.
- Jury prepares, evaluates and scores the report (if necessary) according to the above-mentioned format requirements.
- The progress reports will be evaluated within the scope of scientific and technical criteria by Jury members who are experts in their fields. The total score of the team is determined by summing the scores of all the sections in the report.
- Support will be provided to teams whose report score is above the lower threshold score determined by TÜBİTAK. Teams that have a report score below the lower limit score determined by TÜBİTAK will be eliminated from the competition. Eliminated teams cannot continue in the competition.
- In case of plagiarism, copying etc. in the report, the report will not be evaluated and the team will be eliminated from the race. The rule regarding ethical violations

applies regardless of the institution, school, club, community, or category/competition.

- Teams that are evaluated as unsuccessful in the progress report can object to the evaluation results from the page <https://www.t3kys.com/tr> within five (5) work days from the announcement date. The objections of the teams that are evaluated as unsuccessful in the report will be evaluated by the Jury and the results will be notified to the teams through e-mail. Teams cannot object to the progress report results for a second time.

A.5. Technical Design Report

- The Technical Design Report must contain detailed explanations about the vehicle's development process, final technical and mechanical design of the vehicle and specifications of domestic parts. Specifications of domestic parts must be explained with photographs and technical pictures.
- It is essential for the evaluation that the report contains the requested information clearly and in the required format. The photos of the vehicle from inside and outside may be placed in this report.
- It is the responsibility and obligation of the team captain to prepare the report according to the required format.
- Technical design report preparation guide and report format will be published at www.teknofest.org.
- The report may be prepared in Turkish or English. It is an obligation to prepare the report in only one (1) language.
- If a team is using the Turkish language, it should avoid foreign language equivalents unless there are commonly used Turkish terms for domain-specific concepts. However, if there are different Turkish uses of the concept, the team can act according to personal preference; the equivalent term in the original language can be indicated in parentheses where it first appears in the text, and only the Turkish term should be used thereafter.
- The report must be uploaded on the application system in a PDF format with a maximum size of 100 MB between the stated dates. If the report is not uploaded to the system between the stated dates, the team will be eliminated from the race.
- The report must be prepared in A4 format, 12 type size, Arial, with 1.15 line spacing and bottom-top and side edges are with 2.5 cm; Including cover page, the table of contents, bibliography and appendices, a technical design report cannot exceed 150 pages.
- Using cover page, table of contents and bibliography in the technical design report is not an obligation.
- TÜBİTAK prepares, evaluates and scores the report (if necessary) according to the above-mentioned format requirements.
- A drawing in A4 dimensions (21 x 29,7 cm) showing all the power circuits of the electrical equipment of the vehicle must be given in the technical design report. The

drawing should include the following: battery, fuse, circuit breakers, power control switches, capacitors, motor control circuits (drivers), motor or motors, charging unit and connecting cables.

- All analysis files should be given in the related title as a link in the report.
- Design images should be placed under the relevant title of the report, not provided as a separate link.
- The technical design reports will be evaluated within the scope of scientific and technical criteria by Jury members who are experts in their fields. The total score of the team is determined by summing the scores of all the sections in the report. If the team's score is below the lower limit set by TÜBİTAK, they can participate in the competition week, but they will not be eligible for performance awards.
- Teams that are evaluated as successful in the technical design report will be announced on the www.teknofest.org page.
- In case of plagiarism, copying etc. in the report, the report will not be evaluated and the team will be eliminated from the race. The rule of ethical violation applies regardless of the institution and category/competition, such as the same university/club/community, etc.
- Teams that are evaluated as unsuccessful in the report can object to the evaluation results from the page <https://www.t3kys.com/tr> within three (3) workdays from the announcement date. The objections of the teams that are evaluated as unsuccessful in the report will be evaluated by the Jury and the results will be notified to the teams through e-mail. Teams cannot object to the technical design report results for a second time.
- The score of the technical design report allows teams to participate in the competition by exceeding the minimum score.
- In the scope of the technical design report, ensuring the domesticity of one of the motor driver for international EC competitions, motor driver, battery packaging, or steering system components for inter-school EC competitions enables teams to participate in the competition.
- The score of the technical design report is taken into consideration in the evaluation of the Design and Domestic Product Incentive Awards.
- The score of the technical design report does not have any impact on the outcome of the organized competitions/races.
- The domestic part does not have any effect on the outcome of the upcoming races to be organized.
- The formula used to determine the race end standings of the races has no effect on the ranking of the domestic part.
- Even if a single security element is missing from the penalty list, the vehicle cannot be allowed on the track for testing purposes.

A.6. Test Videos

A.6.a. Dynamic Driving Test Video

- Dynamic Driving Test Video is a part of the technical design video, which will be prepared and delivered as part of the technical design report.
- In the Dynamic Driving Test Video the vehicle shall make slaloms between poles 8 meters apart from each other on a 25 meters long flat surface, turn back and return to the starting point. The driver shall perform a reverse maneuver during turning back to assess the vehicle's maneuverability attribute.
- The schematic view of the maneuvers is given in Figure 1. The driver needs to complete the test with only one reverse maneuver. The viewing angles of the vehicle and quality of the driving are important in the evaluation process.

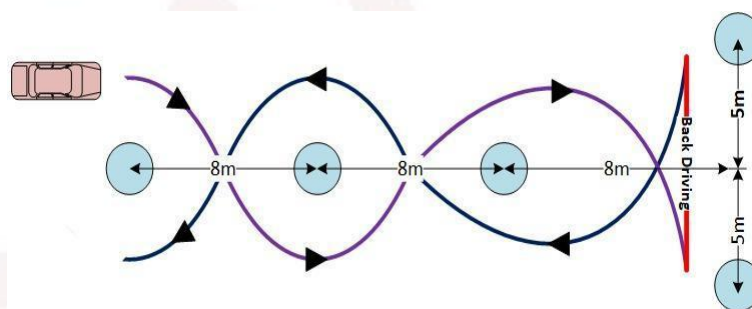


Figure 1. Dynamic driving test area dimensions.

- The video must be in mp4 format and a maximum of 2 minutes and 100 MB in size.
- Security measures in video shooting are the responsibility of the team captain.
- At the beginning of the video, the captain or a member of the team must introduce himself/herself by saying their own name, surname, and team name.
- In order to determine the historical accuracy before the maneuver, it is mandatory for a frame including the vehicle and driver of a Science and Technology magazine published in the video to be present in the video.
- The video is uploaded to an online video platform and the sharing link is given at the designated place in the system.
- In the Technical Design Report, it is mandatory to provide a link to the relevant video.
- Teams that do not upload their videos or that do not fulfill any/all of the above-expected features in the video will be eliminated from the race.

A.6.b. Brake Test Video

- Brake Test Video is a part of the technical design video, it will be prepared and delivered as part of the technical design report.
- The Brake Test Video must be a maximum of 2 minutes and 60 MB in size. In the video, the viewing angles and quality of the vehicle are important in the evaluation. In the first 5-10 seconds of the video, the team captain or driver who will drive the

vehicle must introduce himself/herself by saying their own name, surname, and team name.

- The brake test video determines the braking performance of the vehicle and should be performed on a 10° slope as in Figure 2.
- It is mandatory to show the inclination on the platform where the brake test is performed in the video shoot. For example, showing the inclination of the ground using the phone's inclinometer feature.
- The video is uploaded to an online video platform and the sharing link is given at the designated place in the system.
- In the Technical Design Report, it is mandatory to provide a link to the relevant video.
- The team captain is responsible for uploading the video in the required format.

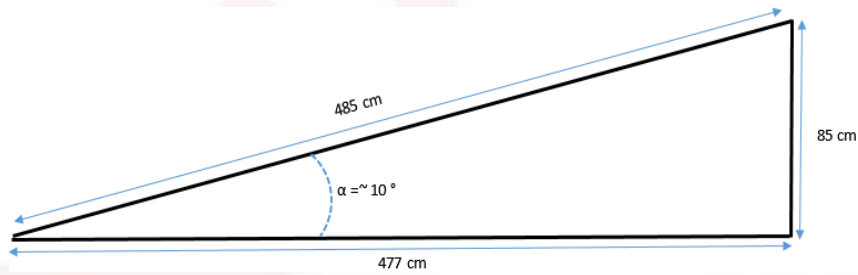


Figure 2. Break ramp.

- The dynamic driving test video and the brake test video should not be merged; they should be uploaded to the system as separate videos.
- Teams that do not upload their videos or that do not fulfill any/all of the above-expected features in the video will be eliminated from the race.

A.7. Related Legislation

- International Efficiency Challenge Electric Vehicle Racing Rules.
- International Efficiency Challenge Electric Vehicle Domestic Product Rules.
- In cases where there is no provision in the relevant legislation, the decisions of TÜBİTAK and the Directorate are applied.

A.8. Contact

- Application and report upload: <https://www.t3kys.com>
- Announcements and Information: www.teknofest.org
- Questions:
<https://groups.google.com/u/1/g/uluslarasrasi-effcency-challenge-elektrkl-ara-yarilari?hl=tr>

B. ADMINISTRATIVE AND FINANCIAL RULES

B.1. Financial Supports

B.1.1. Preparation Support

- It is the financial support paid in cash to the Team Responsible in the competition area in line with the evaluation of the Advisory and Assessment Committee provided that teams are successful in all stages and invited to the competition area.
- Preparation support is 80.000 TRY.
- In order for financial support to be paid, Team Responsible must fill and sign the Letter of Commitment, stating that all the responsibilities and rules of the competition have been accepted, and submit the document to TÜBİTAK official during the registration in the competition area.
- The team captain must request the Letter of Consent of the parent/guardian for all members under the age of 18 and delivered in the race area.
- Teams applying in the Hydromobile category will be provided with 1 (one) fuel cell system and 1 (one) metal hydride hydrogen tank by the Turkish Energy, Nuclear and Mining Research Agency (TENMAK). Within the scope of support:
 - Teams that receive support must participate in the race.
 - Fuel cell system and metal hydride hydrogen tank are delivered to the teams' addresses by a method determined by TENMAK or collected by the teams from TENMAK Clean Energy Research Institute Hydrogen Technologies Laboratory.
 - Metal hydride hydrogen tanks are delivered by TENMAK filled with hydrogen to the teams. If requested, TENMAK provides support for refilling.
 - The fuel cell system and metal hydride hydrogen tank shall be used and stored in accordance with the product manuals and guidelines specified by TENMAK.
 - The team captain is responsible for taking safety precautions during the use of equipment, TENMAK is not responsible.
 - Teams are responsible for delivering the equipment they received in complete and working condition to TENMAK after the race.

B.2. Awards

- The prizes in the table below indicate the total amount to be given to the teams that are entitled to receive awards, no individual awards will be made. First, second and third place prizes will be divided equally according to the total number of team members (excluding the advisor). Team advisors who are entitled to receive an award cannot benefit from the first, second and third prize amounts below, and the awards to be given to the advisors are also specified in the table below.

Table 2.a. International EC awards.

Award	Definition	Amount
Performance Awards (Electromobile and Hydromobile)	First Place	200.000 TRY
	Second Place	150.000 TRY
	Third Place	120.000 TRY
Visual Design Award		45.000 TRY
Jury Special Award		45.000 TRY
Drag Award		70.000 TRY
Domestic Product Awards	First Place	150.000 TRY
	Second Place	120.000 TRY
	Third Place	100.000 TRY

Table 2.b. Advisor awards.

Award	Definition	Amount
Advisor Awards	First Place	9.000 TRY
	Second Place	7.500 TRY
	Third Place	6.000 TRY

B.2.1. Performance Awards

- Performance awards are given to teams that score the highest points in the final races held within the scope of the "Final Race" rules.
- Multiple teams can be awarded the same prize when teams have the same score.
- If the conditions of the race track and the assigned task change, an update can be made to the score limit.

B.2.2. Visual Design Award

- The Visual Design Award is the award given to the team that is unique and aesthetic regarding the interior and exterior appearance of the vehicle (shell, console, cockpit, etc.), industrial production, and/or suitability for daily use.
- In the award evaluation, the technical design report submitted by the teams and the examinations made during the race week are considered.
- This award cannot be given to teams that have not completed their technical checks and received their stickers.
- If deemed appropriate by the Jury, the Visual Design Award can be given to more than one team from the teams that get stickers in the Electromobile and Hydromobile categories and go to the race track. In this case, the award amount specified in the table is transferred to each team.

- If the criteria are not met, the award may not be awarded.
- Teams applying for the Visual Design Award must submit a Visual Design Award Application file in addition to the Technical Design Reports. This application file should include high-resolution photographs of the vehicle taken from different angles. The team should express the application justification in detail in this report.

B.2.3. Jury Special Award

- The Jury Special Award is the award that is given to the team that brings innovation to the race and makes positive contributions to it's spirit apart from performance and design.
- For the evaluation of the award, the observations made by the Jury and TÜBİTAK officials during the race week are taken into consideration.
- If deemed appropriate by the Jury, the Jury Award can be given to more than one team from the teams that get stickers in the Electromobile and Hydromobile categories and go to the race track. In this case, the award amount specified in the table is transferred to each team.
- If the criteria are not met, the award may not be awarded.

B.2.4. Domestic Product Awards

- The domestic product incentive awards are given to teams that have received the sticker of being eligible to participate in the competition in the International (Electric and Hydroelectric Vehicle) and Inter-High School (Electric Vehicle) categories, which are superior in terms of domestically designed and manufactured products used in vehicles.
- Efficiency Challenge Electric Vehicle Races will be awarded based on the criteria stated in the Domesticity Rules Booklet.
- At least one mandatory domestic part and four non-mandatory (optional) domestic parts can be considered domestic by teams that make them domestic, taking into account the conditions specified in the Efficiency Challenge Electric Vehicle Racing Domestic Rules Booklet, within the scope of this award.
- In technical inspections by Jury, it will be checked whether the parts declared as domestic in the technical design report meet the domestic content requirement, and the score of the relevant part in the technical design report will be considered to determine the score of the candidate team for this award.
- If the normalized scores of two teams are equal, the team with a higher number of domestic players will be ranked above the other team.
- When ranking in the international category, no distinction will be made between the categories of Electromobile and Hydromobile.

B.2.5. Transferring of the Awards

- Financial Support and Awards of the finalist teams participating from abroad (including Azerbaijan and TRNC) will be paid to the Team Responsible in cash in the competition areas or TEKNOFEST area.

B.3. Other Provisions

- During the competition, all participants must follow the announcements made on the <http://www.teknofest.org> website and sent to their registered e-mail addresses at <https://www.t3kys.com>
- If deemed necessary by TÜBİTAK, changes in the rules booklet can be made until the application deadline.
- The most recently announced updated rules booklet is valid in the competition.
- In the event of a disagreement concerning the technical rules, the decision of Jury will be valid. In cases where there is no provision in the Rules, the decision of the TÜBİTAK RUTE will be applied.

C. TECHNICAL RULES

- A team must have fulfilled the requirements for participating in the race prior to the Completing Race Week Registrations stage, as specified in Table 1 (Progress and Technical Design Report, Video, etc.).
- Teams must provide products/components related to the topic headings specified under this title, either as domestic or ready-made products/components. Otherwise, they will not be eligible to participate in the competition.
- In order for a team to be eligible for technical evaluation in the race week described in this section of the guide in the International (Electromobile and Hydromobile) category, it is required that the team has made at least the motor driver of the domestic parts specified in the Domestic Rules Booklet.
- In order for a team to be eligible for technical evaluation in the race week described in this section of the High School Inter-District (Electromobile) category guide, they must have made at least one of the mandatory domestic parts specified in the Domestic Rules Booklet (motor driver, battery packaging, or steering system) domestic.

C.1. Drawing of Electrical Schematic and Equipment Placement

- A drawing in A4 dimensions (21 x 29.7 cm) showing all the power circuits of the electrical equipment of the vehicle must be submitted in the technical design report (see Figure 5).
- Drawing should contain the battery, fuse, circuit breakers, power control switches, capacitors, motor control circuits (drivers), motor or motors, charging unit and connecting cables.
- A second drawing must be submitted which shows upper view of the vehicle which clearly shows the location of these components on the vehicle.

C.2. Electrical Safety

- All vehicles must comply with the rules laid down by the national authorities regarding the standardization and use of low-voltage electrical equipment.
- The power circuit includes all parts of the electrical equipment used to drive the vehicle.
- Auxiliary circuit covers all parts outside the power circuit.
- All parts of the electrical equipment must be protected by at least IP 44 type (safe against dust and splash water). IP 55 protection is also recommended.
- Any electrical connection between energy-generating equipment and energy-consuming units must be able to be interrupted by 2 non-sparking circuit breakers (top-press emergency power-off switch/emergency stop), one outside the vehicle

and one inside the vehicle (see Figure 3). The characteristics of circuit breakers are given below.



Figure 3. Emergency stop button examples.

- i.** Emergency circuit breaker switches must control a contactor and should cut whole electricity supply in the vehicle. For this purpose, Automotive relays (designed for headlights, horns, etc.) instead of contactors are not suitable. Vehicles where the electricity is directly cut off with high current emergency stop buttons without using contactors will not be allowed to participate in the competition.
- ii.** The interior emergency button should be easily visible to the driver and easily accessible from the outside if necessary.
- iii.** The external emergency breaker should be located below the cockpit window and behind the driver's door on the left side of the vehicle.
- iv.** Both emergency buttons must consist of a yellow circle with a diameter of at least 8 cm and a red button in the middle.
- v.** The circle should have the word "Emergency Stop" written in red or black letters.
- vi.** The external emergency breaker must be indicated by a red lightning bolt inside a blue triangle with a white border, with sides of at least 12 cm.
- vii.** Attention should be paid to the placement of the emergency stop button to be placed outside. Considering that the vehicles pass very close to each other in some cases during the race, it should be considered that in case of a possible contact with the emergency stop button, the entire circuit should be cut off, and if necessary, measures should be taken in the shell design to prevent this situation.
- viii.** Examine the circuit drawings for sample power-off circuits (see Figure 4). Connection types in which all energy consuming units in the vehicle are not de-energized when the key is pressed are not accepted and the vehicle cannot enter the race.
- ix.** In technical inspections, after the other controls of the vehicle are completed, it is tested whether the emergency stop buttons are functional or not, by pressing them while the vehicle is running and in motion, if all the equipment on it is in working condition. During this inspection, vehicles that pose a risk to safety due to their circuit breaker connections, current values, cable thickness, etc. are not allowed to participate in the race. Checks are conducted to ensure the suitability of these factors. Electrical connections using high-current emergency stop buttons without the use of contactors are not suitable.

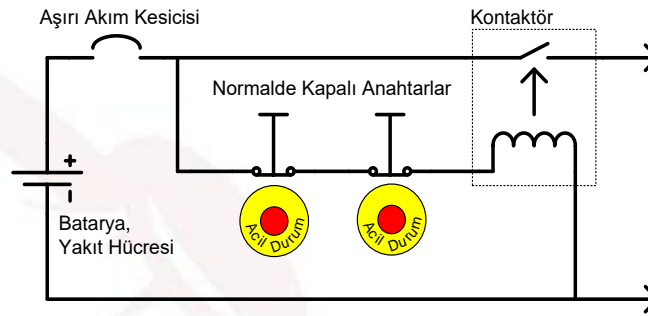
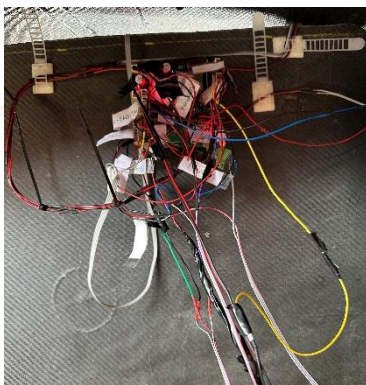


Figure 4. Sample breaker circuit with low-current emergency stop switch.

- All electrical cables in the vehicle must be protected by an overcurrent breaker (fuse, etc.) rated for the diameter of each conductor. The usage of overcurrent breakers and emergency stop button separately is mandatory.
- The connection cables to be used between the battery and the circuit breaker connected to its output and in the motor connections must have a cross section of at least 4 mm². Cable thicknesses should be increased according to the value of the current drawn by the motors and the loads. The maximum current transmitted by the cables should not exceed 5 times the value in mm² of the cable cross-section used. The breaking current of the overcurrent circuit breaker should not be more than 7 times of the cable section used.
- Cables must be in a suitable cable sheath or conduit and bare cables should not be used. Electrical cables should be in the colors specified in the standards, there should be no cables with uninsulated ends. Harnesses must be properly clamped.
- Vehicles that do not use cables in colors that comply with the standards, whose cable thicknesses do not meet the criteria given above, where the cable ends are open, the cables are not in the duct or sheath, the duct or sheath is not fixed, and the cables are scattered, cannot pass the technical inspections.
- When the vehicle breaks down or needs to be towed during a race, the towing process is performed by lifting the front of the vehicle with the help of a tow truck. In this case, it is the responsibility of the team to disconnect the connection between the engine and the motor driver. Additionally, if any problems arise during the towing of the vehicle, the team will be held responsible.



An example of cable disorganization.



An example of cable organization.

- The value of the maximum RMS current carried by the cables used in the vehicle should not exceed 5 times the cross section of the cable used in mm². (For example, the maximum current that can pass through the 16mm² cable used in the vehicle should be 80A RMS.) The cables used in the vehicle will be checked in this context, and vehicles that cannot meet this condition will not pass the technical inspections.
- It is obligatory to have a circuit breaker with a suitable value at the battery outlets of the vehicles, which will cut off all the electricity of the vehicle. The use of DC type miniature circuit breakers is recommended for driver and racing safety. In cases where DC or AC type circuit breaker is used, the DC current and voltage braking capability must be suitable for the load and the cable used. In addition, it is obligatory to use a glass fuse or car fuse of suitable value at the output of the DC-DC converter for load feeding. (see Figure 5).
- The power and control cables in the vehicles should be regulated by keeping a distance from the moving equipment (wheel, suspension, steering, shaft, engine rotor, etc.) as much as possible. Cabling that is thought to create a dangerous situation cannot pass technical inspections.
- The diagram showing all the power circuits of the electrical equipment of the vehicle should be drawn in A4 dimensions (21x29.7 cm) in accordance with the format given in Figure 5 and should be brought during the technical inspections. If the drawing is not brought during the technical checks, the drawn circuit diagram and the final situation on the vehicle are inconsistent, the vehicle cannot pass the technical checks.

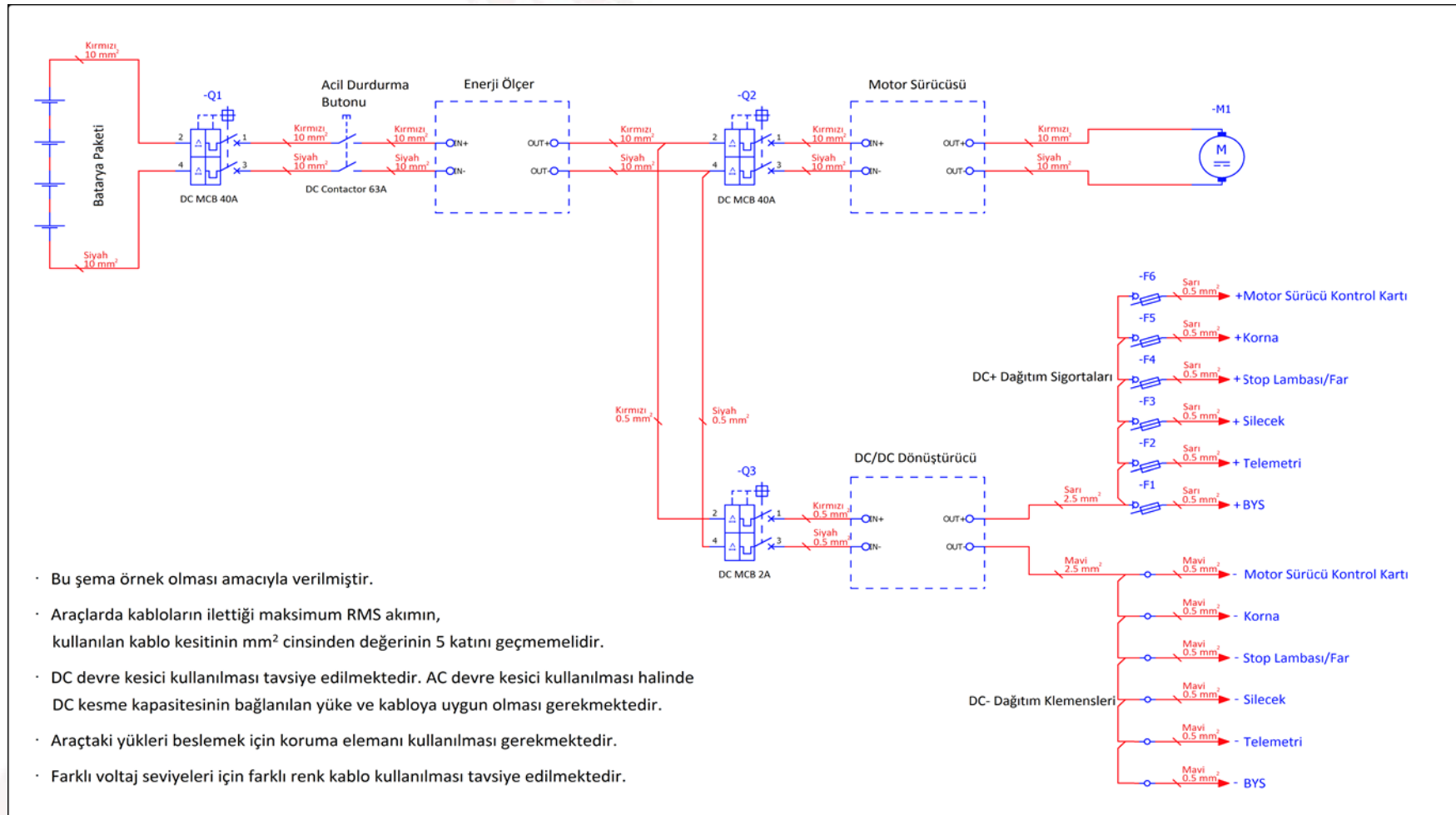


Figure 5.a. Sample distribution diagram (Electromobile).

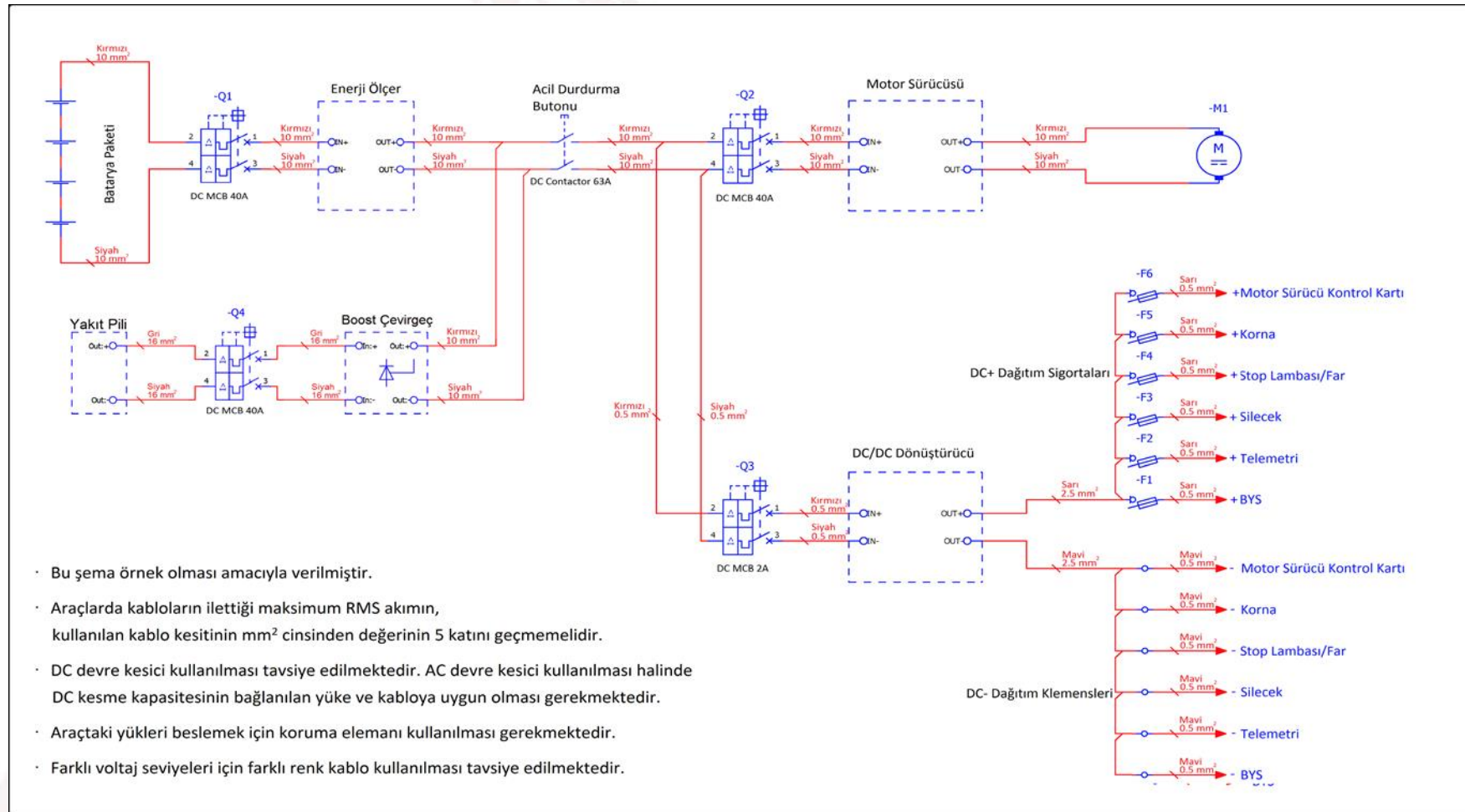


Figure 5.b. Sample distribution diagram (Hydromobile).

C.3. Energy Meter Device

- The energy consumed by vehicles is measured with the energy meter device provided by TÜBİTAK. Considering the vehicle as a holistic system, the energy meter measures the total energy consumed by all components in the vehicle.
- The device takes its energy from its internal (own) battery to work.
- In order to read the measured value, there is an LCD screen on the device that shows the measurement time and the energy consumed in the specified time.
- Current range for measurement is 0-100 A and voltage range is 24-200 VDC. Power measurement error tolerance is maximum $\pm 1\%$.
- When the maximum current and/or voltage limit is exceeded, the power calculation is made by considering the double value of these limits as a penalty.
- Net energy calculation is made by considering the two-way energy flow. The energy recovered during braking is deducted from the net energy.
- The connection of the energy meter to the vehicle electrical system is shown in Figure 6. The connectors should be pre-connected to the vehicle electrical system as shown in the figure so that the energy meter can be easily attached to the vehicle when necessary and the battery line can be bypassed when the energy meter is not used.
- This cable is cut, and connectors are attached, then the energy meter is connected in series to the electrical system with the connectors. No electrical connection should be taken for any component of the vehicle before the energy meter connection point.
- At the battery output, in the main cable line where energy is distributed to all components (both positive and negative cables), there should be a sufficient cable space left and a cover that can be easily accessed from outside the vehicle for intervention.
- To ensure the connection of the energy meter, a cable gap of approximately 15 cm should be left on both sides of the cable. The products with the codes 6810G2-BK and 1319G6-BK are used as connectors and connection materials. An example product visual is provided in the figure. Non-original products may vary in color but have the same current carrying capacity.

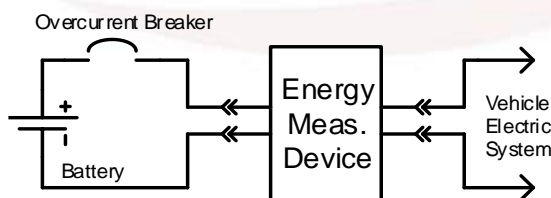


Figure 6.a. The device connection to the vehicle electric system.

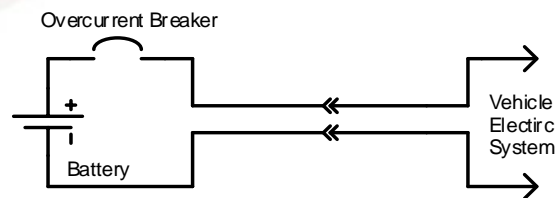


Figure 6.b. Connection when the device is removed.

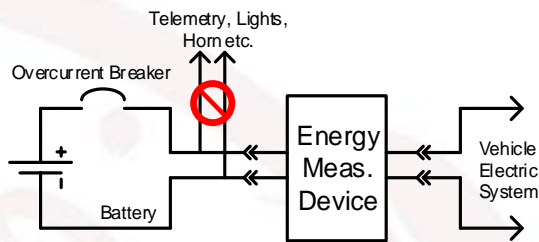


Figure 6.c. Unacceptable connection.



Figure 6.d. Connector product visual example.

Figure 6. Energy meter connection methods to the vehicle electrical system.

C.4. Hydrogen Consumption Measuring Device

- Hydrogen consumption is measured with a calibrated flowmeter provided by TÜBİTAK.
- The flow meter will be battery-powered and will have no electrical connection.
- The flow meter will be connected to the hydrogen line before the fuel cell with a 6 mm connection (or ¼ inch) in a direction suitable for the gas flow (see Figure 7), and it will be returned after completion of the race.
- The flow meter must be located inside the vehicle where the driver cannot reach it and it must be easily readable from outside. The suitable location for integrating the flow meter into the vehicle will be determined based on advice from the Jury.



Figure 7. Connection of the H₂ flow meter in the gas flow direction.

C.5. Drive System and Electrical Equipment

- Using a manually controlled potentiometer as the accelerator pedal is not suitable for safety reasons in all vehicles. Instead, a foot accelerator pedal should be used that will return to the starting position when pressure is released and will be located to the right of the brake pedal. Vehicles without a suitable accelerator pedal will not be allowed to participate in technical inspections.
- In the vehicles that will compete in the Electromobile category, the battery group should be used as the main and only energy source. A second type of energy provider (fuel cell, etc.) cannot be used in vehicles. Super capacitors can be used, provided that their properties are specified in the Technical Design Report.
- In addition, in the motor drive system (between the battery output and the motor), capacitors and/or coils, etc., with capacities exceeding their purpose and used for energy storage. equipment should not be used. The energy capacity of the energy storage elements (passive components used for filter purposes) in the motor drive

system is limited to a maximum of 1000 Joules (to be calculated with the capacitor's label value).

- It is expected that batteries and fuel cells will be used in Hydromobile vehicles. The nominal fuel cell (may be more than one) to be used, the sum of the output power values can be a maximum of 3 kW and a minimum of 300 W.
- The output power of fuel cell modules can vary in positive or negative directions depending on the type of reactant gases fed (for example, the use of O₂ instead of air) and the feeding conditions of the gases (temperature, humidity, pressure values, etc.). For this reason, only the label value of the power modules will be taken into account (teams are asked to document this label value) and control is made over this value.
- The operating conditions of the fuel cell module can be different for each team as long as the safety precautions are followed, and the output performance of the modules can be increased provided that appropriate safety precautions are taken.
- If the fuel cell is supplied with oxygen, the oxygen and hydrogen lines should be placed at a distance of at least 10 cm between them. The anode and cathode outputs of the fuel cell will be independent of each other and will be released to the atmosphere from the back of the vehicle with two separate discharge lines. The fuel cell water vapor outlet should not be upwards to prevent the water from blocking the gas outlet and creating pressure.
- Super capacitors can be used in Hydromobile vehicles (provided that the specifications are specified in the technical design report). The super capacitor to be used must be connected to the system via a converter. Contactor, relay, static switch etc. Circuits and equipment with only on-off feature are not considered as converters. If used, the energy capacity of the supercapacitor is limited to a maximum of 110 kJ (to be calculated with the label value of the capacitor).
- Before and after the race, the energy difference is calculated by measuring the super capacitor voltage. The terminals of the supercapacitor must be moved to an accessible point for voltage measurement. Explanations on the use and measurement of supercapacitors in Hydromobile vehicles are given in Figure 8.

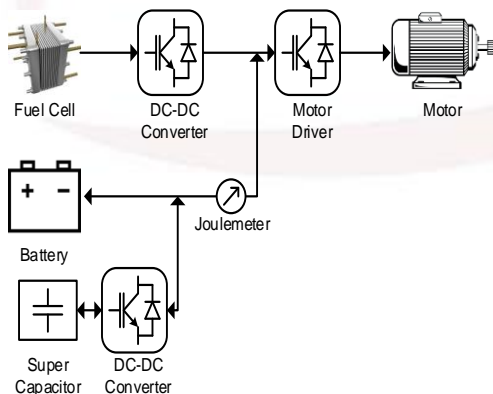


Figure 8.a

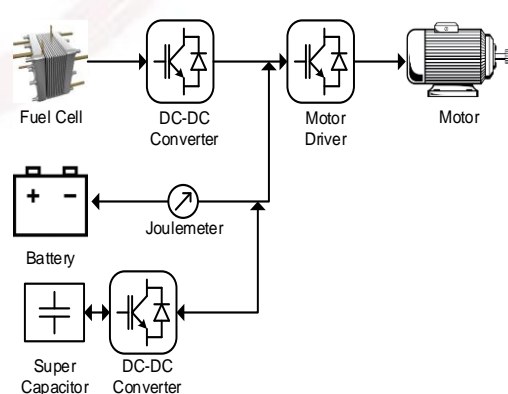


Figure 8.b.

Figure 8. In Hydromobile vehicles, the use of supercapacitors and energy measurement.

- In Hydromobile vehicles, super capacitors can be used to store the energy released during braking and to use this energy during the acceleration process. Supercapacitors should not be connected directly to the fuel cell or battery, but they can be connected to the DC bus with suitable bidirectional DC-DC converters.
- The connection in Figure 8.a is recommended in order to accurately measure the energies stored in the supercapacitor before and after the race. In Figure 8.a, an example super capacitor connection diagram is given by taking one of the connection drawings in Figure 5 as an example. Supercapacitors can also be added to the other wiring diagrams indicated in Figure 5.
- For technical reasons, if the supercapacitor is connected between the energy meter and the motor driver as shown in Figure 8.b, the capacitor voltage is measured before and after the race and included in the energy calculation. Teams in this situation should remove the terminal for easy measurement of the supercapacitor voltage to an accessible point.
- Only electric motor types can be used in all vehicles that will participate in the race.

C.6. Physical Specifications

- Vehicles are expected to be suitable for urban driving and prioritize efficiency. For this purpose, vehicles must have at least two seats, at least two doors, and four wheels (including the specified dimensions).

C.6.1. Vehicle Measurements

- Vehicle height must be a minimum of 100 cm and less than 1.25 times the vehicle width ($100 \text{ cm} < \text{vehicle height} < \text{vehicle width} \times 1.25$ (150 to 225 cm)). See Figure 9, Dimension “H”.
- The distance between opposite wheels must be greater than half the width of the vehicle (A).
- The vehicle width must not be less than 110 cm or more than 180 cm ($109 \text{ cm} < \text{vehicle width} < 181 \text{ cm}$). See Figure 9, Dimension “A”.
- Vehicle length must be a minimum of 200 cm and a maximum of 425 cm. See Figure 9, Dimension “L”.
- Track width of the front wheels must be a minimum of 100 cm, and the track width of the rear wheels must be a minimum of 80 cm. See Figure 9, Dimension “W_fr”, “W_back”.
- The distance between the front and rear wheels must be a minimum of 130 cm. See Figure 9, Dimension “B”.
- During technical inspections, the vehicle dimensions will be checked by examining whether the vehicle is within the lines drawn in the control area.
- The distance between the seat and the ceiling on the space reserved for driver and passenger must be at least 85 cm and the distance between the seat and the

windshield should be at least 65 cm. Distance controlling will be carried out by performing the emergency evaluation test.

- The ground clearance of the vehicle must be at least 10 cm. Figure 9 dimension “C”.
- Ground clearance will be checked with a rod that is 9 cm height. That rod must move without touching the underside of the vehicle. The detail of how to measure related article in the vehicle dimensions in technical inspections is shown in Figure 9.
- The ground clearance check will be performed while the pilot is sitting inside the vehicle.
- There is no lower limit for the vehicle weight. Vehicles that the jury believes to be unsafe and whose doors and other parts will be damaged by the wind will be expelled due to security violations.

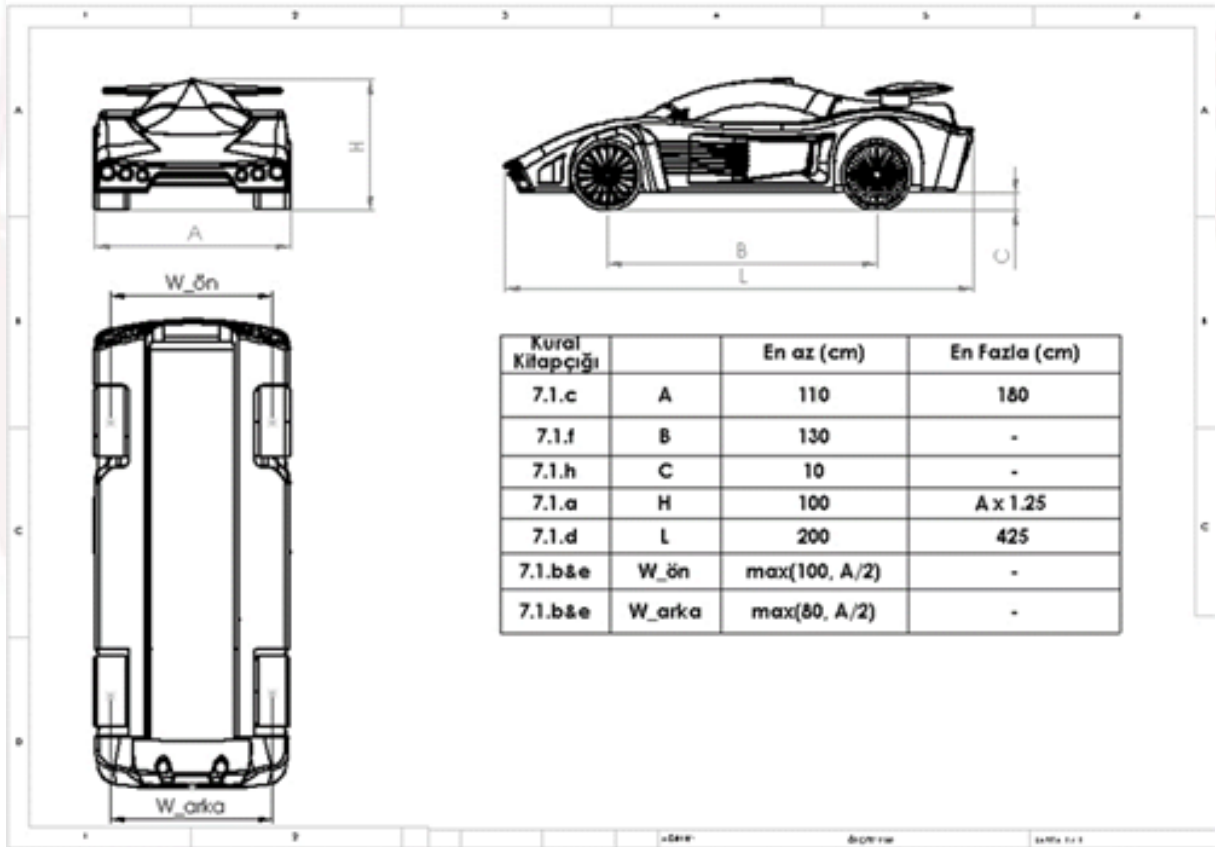


Figure 9. Vehicle dimensions.

C.6.2. Vehicle Body

- The vehicle body must be fixed in such a way that it includes all mechanical and electrical parts. All parts must be completely inside the vehicle body when viewed from the front, back, or top (including all wheels). The shell of the vehicle must not be in contact with the road, tires, or any other component.

- In technical inspections, if needed, the vehicle should be produced with a cover design that can be opened in front of and behind the shell in order to make under-shell inspections. It shall be possible to access/inspect internal parts by opening these covers if required.
- The vehicle body must have a sturdy structure to protect the driver.
- There must be a completely isolated design between the interior and exterior of the vehicle. There should not be any part of the vehicle that is open to the outside. The road and wheels should not be visible when viewed from the cockpit. Vehicles need to have a solid base that ensures complete isolation between the cockpit and the road surface.
- In cases where brake wires, pipes, hoses, electrical cables and electrical components are required to be mounted outside the vehicle, these parts must be protected from any risks that may cause damage, such as stone impacts, dust or mechanical failures. It is required that all equipment be mounted inside the vehicle shell be protected against risks such as fire and short circuits.
- The vehicle body must not have any sharp and pointing protrusions that could damage other vehicles during the race. The cockpit must be completely isolated from the external environment. The cockpit and the driver must be protected from foreign materials, such as stones, that may come from the road.
- The vehicle should not be designed as a roadster; the upper part of the vehicle should be completely closed.
- During technical inspections, all elements that may pose a risk to the driver and other vehicles will be checked.
- The cockpit and the energy compartment must be completely isolated from each other. For this purpose, a fireproof separator (made of carbon fiber or sheet metal) should be placed between the two compartments to prevent the risk of fire.
- The separator must extend to the top and sides of the vehicle. There should be no access from the cockpit to the energy compartment. The use of hybrid materials (metal on the energy compartment side, wood on the driver side) will be accepted as long as they are fire resistant.
- There should be no gap between the separator and the vehicle body. Gaps should be filled or sealed with fire retardant materials.

C.6.3. Door

- It should be easy for the driver and the passenger to enter and exit the vehicle. There shall be at least one door that opens from the top or two doors that open from the sides, allowing the driver to get out in the event of vehicle turnover.
- Door dimensions must be at least 50 x 80 cm.
- During technical inspections, the frame must pass through the door with dimensions of 50 x 80 cm. If the frame is larger than the door, the vehicles are not properly designed.

- Any door to be used for access to the vehicle should be fixed to the body with a reliable fastener such as a hinge or slide mechanism. The door mechanism should be able to close by itself, and when opened, it should be able to stand firmly without being deformed from the hinge part.
- The door lock mechanism must allow the door to be opened from the inside and outside in emergencies. The locking mechanism should automatically lock when the door is closed and should not allow the door to move back and forth or up and down.
- While the door is closed, the door lock must automatically engage in the latch slot fixed to the vehicle body without interfering with the door handle. Figure 10.a shows examples of appropriate door lock mechanisms.
- Door mechanisms that do not have an opening latch on the inside and outside of door will not be accepted. Unsafe and non-durable locking mechanisms such as plastic clamps, sliding locks, locks that can only be opened by means of a key and operate with the principle of tight fit will not be accepted. Figure 10.b shows some examples of inappropriate locking mechanisms.
- Thin door bodies made of materials such as carbon fiber create a security vulnerability since they cannot maintain their solid form (rigid structure). Such door bodies cannot provide sufficient integration with the vehicle body in the closed state due to the long distance between the hinge and the door handle and cause unintentional opening. To overcome this problem, the teams are expected to add metal support elements to the door body and strengthen the existing structure and bring the door to a solid form (rigid structure) that moves as a whole.



Figure 10.a. Appropriate



Figure 10.b. Inappropriate

Figure 10. Appropriate and Inappropriate door lock mechanism examples.

- In the door mechanism, the door cannot be closed without manual intervention on the door handle, and if a secure and solid structure is not provided in the mechanism, the door will not be suitable for racing and driver safety. In this case, penalty points are applied to the team and the team is allowed to participate in the race (see Appendix 2: Penalty List).

- In door designs, the direction of the door opening should be forward, as is common in modern vehicles.
- It is not acceptable to stick the door with duct tape or secure the door from the inside with plastic zip ties. If similar situations are observed before or after the race, the team will be disqualified. (see Appendix 2: Penalty List).

C.6.4. Weight

- Since the main goal of the competition is efficiency, there is no lower limit on vehicle weight. However, if the vehicle is not deemed suitable for the safety of the driver and other competitors, the team may be expelled from the race by the TÜBİTAK.

C.6.5. Wheels

- The wheels to be used in vehicles should comprise a hub, rim, and tire.
- There is no restriction on the rim dimensions of the wheels and the material they are made of if they do not extend beyond the vehicle.
- Teams need to use tires with a size of 90/90-16 or 90/90-17. The appropriate rim dimension (shown as "dimension A" in Figure 11) is ideally 55 mm and can be a maximum of 63.5 mm under ideal conditions.

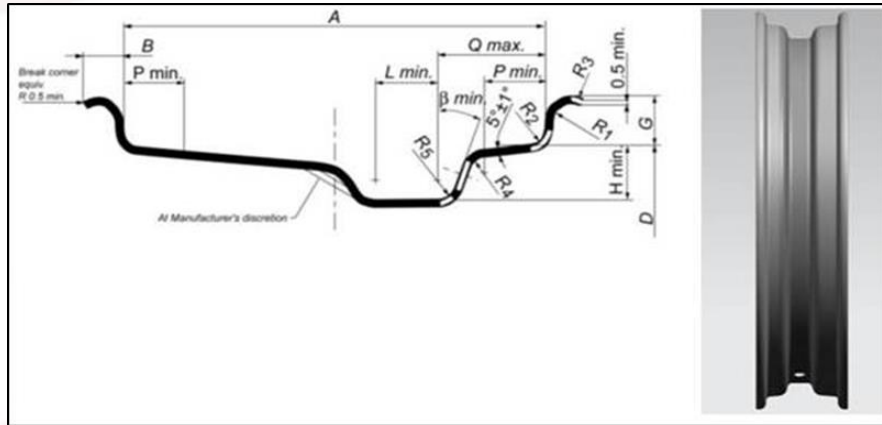


Figure 11. Rim contour dimensions.

- The use of wider or narrower rims is at the discretion of the teams, and the teams that create risks for the race's safety will be banned from the race.
- It is forbidden to heat, physically manipulate, or subject the wheel tires to any chemical treatment.
- If TÜBİTAK provides the tires, it is mandatory to use the provided tires. In case of using a different tire, the team will be disqualified.
- If TÜBİTAK provides tires, it is mandatory to use the provided tires. TÜBİTAK may require the use of a specific model tire. In case of using a different tire, the team will be disqualified. The following points should be considered for the tires that TÜBİTAK will make mandatory:

- The maximum load on a 90/90-16 size tire is 180 kg, the recommended maximum inflation pressure at a maximum speed of 150 km/h is 33 psi or 2.3 bar. In the event of tire pressure measurement in vehicles, if a value greater than the specified pressure value is detected, the team is considered to have used one race opportunity.
- The maximum load on a 90/90-17 size tire is 180 kg, the recommended maximum inflation pressure at a maximum speed of 150 km/h is 33 psi or 2.3 bar. In the event of tire pressure measurement in vehicles, if a value greater than the specified pressure value is detected, the team is considered to have used one race opportunity.

C.7. Safety Equipment

- The vehicles that have the potential to cause damage to other teams' vehicles on the race track and pose a safety risk are disqualified from the race.

C.7.1. Placement of Battery Pack

- The area where the battery pack is placed must be solid and separated from the cockpit by a curtain (metal or similar) that is fireproof for at least 5 minutes.
- There must not be the slightest transition point between the battery pack and the cockpit. If there is a gap between the fireproof material and the shell, this gap should be covered with heat-resistant metal-based tapes.

C.7.2. Location of the Fuel Cell Stack

- For the vehicles in the Hydrogen Vehicles category, the space where the fuel cell will be placed must be separated from the cockpit by a durable and fireproof (at least 5 minutes) divider (kestamite, etc.).

C.7.3. Location of the Battery Package and the Fuel Cell Stack Together

- For the vehicles in the Hydrogen Vehicles category, the battery package and the gas connection lines (hoses, valves, etc.) must be strictly separated from each other. For this purpose,
 - i. The battery package and the fuel cell stack must be located in different places in the vehicle (e.g., in the front or back of the vehicle)
 - ii. The battery pack and the hydrogen gases must be separated using fire-resistant materials.

C.7.4. Safety Belts

- Seat belt usage is mandatory for both the driver and the passenger.
- It is necessary to use a safety belt that is fixed at four or five points according to FIA standards.

- Safety belts that do not meet FIA standards will be considered for disqualification due to violating safety rules.
- If TÜBİTAK provides the belts, using the supplied belts with appropriate fasteners from five points is mandatory, as shown in Figure 12. Not using the provided belts is grounds for disqualification.



Figure 12. Safety belts.

C.7.5. Helmet, Racing Suit, Gloves, and Shoes

- The inner parts of the helmets to be used during the race should be made of fire-retardant material. Helmets must be in a form that will protect at least the head, face, ear, and neck against impacts. Bicycle helmets that protect only the head would not be accepted.
- Certification labels on the helmet must be legible. There should be no cracks or cracks on the inner and outer surfaces of the helmet. Half (three-quarter) or full-face helmets should be used.
- It is obligatory to have a collapsible visor in the helmet model to be selected, and it is forbidden to wear protective glasses other than sunglasses or prescription glasses that the competitor will use.



Figure 13.a. Accepted types of helmets.



Figure 13.b. Types of helmets that are not accepted.

Figure 13. Types of helmets that are accepted and not accepted.

- A racing suit with an FIA certificate, specially manufactured for races, will be used to protect the driver in the event of fire (see Figures 14 and 15).
- It is suitable for gloves and shoes to have an FIA certification or to be made of fireproof material (leather, etc.) Hardware that does not meet these specifications will not be accepted. These equipment can be any brand with FIA certification.



Figure 14. Racing suits.



Figure 15. Gloves.

Table 3. FIA approval status.

Equipment	FIA Onayı Durumu
Gloves	Not obligatory
Shoes	Not obligatory
Helmets	Not obligatory
Passenger Seat	Obligatory
Racing Suits	Obligatory

C.7.6. Fire Extinguishers

- Providing one 2-kg or two 1-kg fire extinguishers in vehicles is obligatory. The extinguishing substance should be dry chemical dust in accordance with type C fires.
- In technical inspections, the location of fire extinguishers is checked to ensure that they are easily accessible to the driver, securely attached but removable, and not expired.

C.7.7. Roll Bars and Roll Cages

- Roll bars and roll cages should be designed in a cage structure to ensure the safety of the driver and passenger in case of an accident, independent of the vehicle as a whole.
- Roll bars should be connected to the vehicle chassis at least from four points through welding or bolt nut connection, in a perpendicular position to the vehicle base/bottom.
- The distance between bolts should be a minimum of $2.5 D$, and they should be a minimum of $1.5 D$ from the sides.
- The bolts used must have a minimum diameter of 8 mm and 8.8 grade.

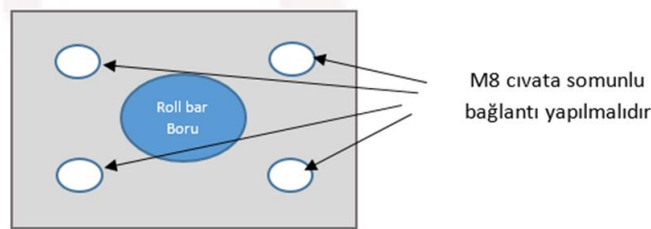


Figure 16.a. Chassis port plate.

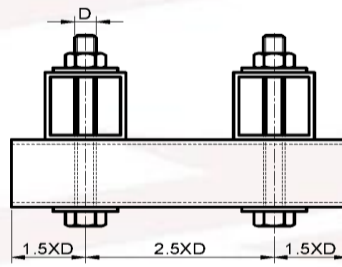


Figure 16.b. Sizing of bolts.

Figure 16. Chassis connection points and bolt connection structures.

- The profiles used for roll bars and roll cages must be closed, rolled pipes or box profiles. Open profiles and profiles closed with welding are not accepted.
- For the profiles to be used as roll bars and roll cages, pipe profiles must have a minimum diameter of 30 mm and a minimum wall thickness of 1.5 mm, while box profiles must have dimensions of at least 25x25 mm and a minimum wall thickness of 1.5 mm.
- The use of vehicle chassis made of aluminum, carbon fiber, and honeycomb materials as roll bars and roll cages is not accepted.
- The use of steel and steel derivative materials is mandatory for roll bar and roll cage. The relevant materials must have a minimum yield strength of 200 MPa.
- Teams that are found to use materials other than steel and steel derivatives in the production of roll bars and roll cages will not be allowed to participate in the race.
- Roll bars should be made from a single piece of profile, and extended roll bar designs made by additional connections will not be accepted.
- The roll bar design that is not acceptable is shown in Figure 17.

- On roll bars and roll cages, no holes can be drilled, or welds made except at the points where they are connected. Drilling holes to reduce weight is considered a safety violation and can result in expulsion.
- A pipe profile that is suitable for lateral connection to the rear roll bar should be welded. (see Figure 18)
- The roll bar must start from the bottom of the vehicle and be attached to the bottom.

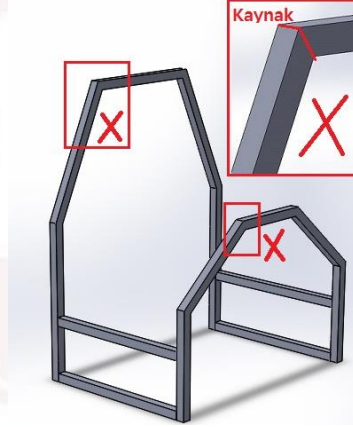


Figure 17. Roll Bar/Roll Cage welding joint point examples.

- A roll bar and roll cage are independent units from the chassis and all their components must have a closed section. It is necessary to build a common roll bar for both seats.
- The distance between the driver's roll cage and the surface of the roll cage facing the vehicle bottom must be at least 20 cm.
- The design of a sample roll bar and roll cage is given in Figure 18.

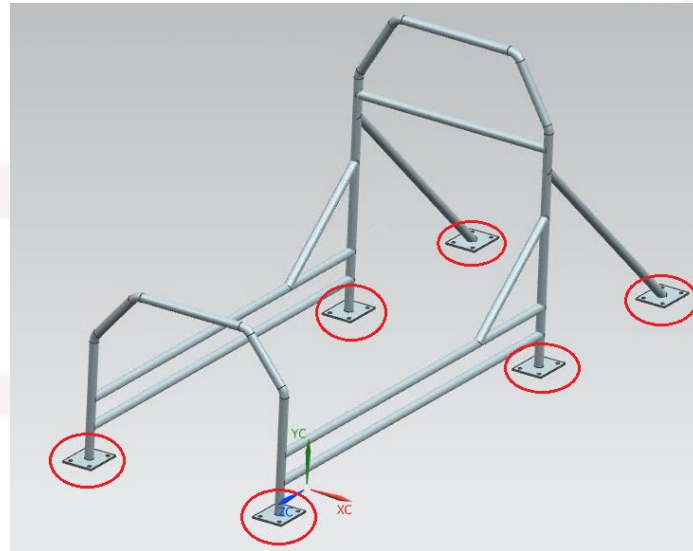


Figure 18. Example roll bar and roll cage design.

(The design that should be with the front and rear roll bar belt, rear connection pipe and supports)
 (This is just an example, different designs can be made as long as they meet the specified conditions)

- a) Connections circled in red must be connected to the chassis with at least M8, 4 screws and/or nut bolts.
 - b) Roll bars and roll cages should be bent from pipes or box profiles with a suitable diameter, while preserving the shape of the profile.
 - c) Except for the roll bar chassis connection points enclosed in red circles, welded joints should be used for all roll bar roll cage connection points.
 - d) If there is a distance of more than 50 cm between the point where the roll bar is connected to the roll cage and the highest point of the roll bar, a support should be welded between the front and rear roll bars.
 - e) If the vehicle chassis is made of metal, welding can be used to join the roll bar to the chassis connection points.
 - f) For welding connections on roll bars and roll cages, the minimum thickness of the weld must be not less than 3 mm, and the weld must be continuous.
- Using aluminum profiles (see Figure 19) is not compliant with the regulations.

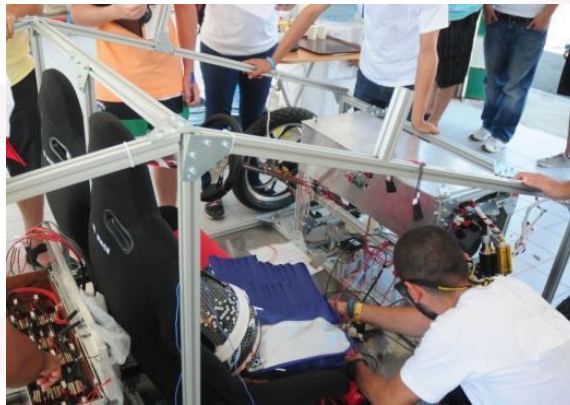


Figure 19. Aluminum sigma profile.

- The roll cage should be designed and manufactured as a frame that surrounds the driver, independent of the chassis, rather than being welded supports between the front and rear roll bars.
- The driver and passenger must be inside the cage structure created by the roll bar and roll cage while in the vehicle.

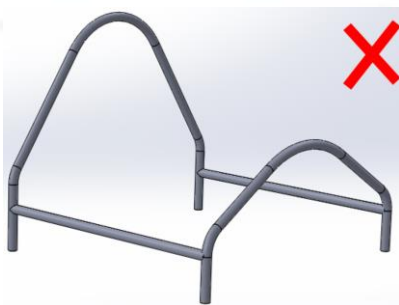


Figure 20.a. Roll bar/Roll cage-I.

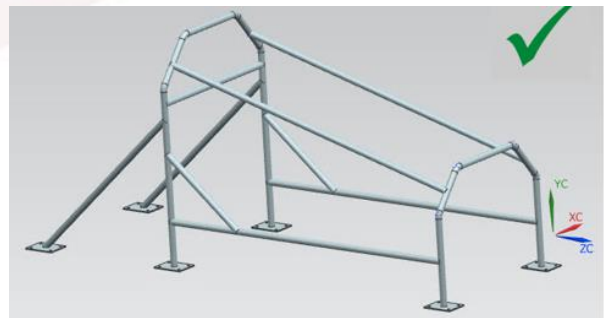


Figure 20.b. Roll bar/Roll cage-II.

Figure 20. Roll bar/Roll cage structures.

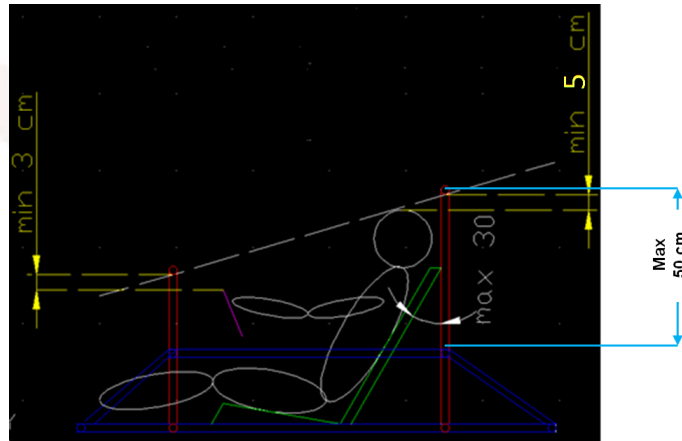


Figure 21. Sitting position of a driver inside the vehicle and position of roll bars and seat.

- a) Roll bars should be connected to the vehicle chassis in a vertical position to the vehicle base.
- b) The roll bar must be at least 3 cm above the top point of the steering wheel.
- c) The rear roll bar should be at least 5 cm above the helmet when the pilot is seated in the racing position with the helmet on.
- d) 50 cm long unsupported roll bar design is a safety violation and the reason for elimination.
- e) The driver's seat, which is fixed to the chassis, should have a maximum recline angle of 30 degrees.
- f) While sitting in a racing position with a helmet on, the top point of the helmet should be below the imaginary straight line drawn between the top points of the two roll bars.
- g) If it is observed during the race that the helmet of the helmeted pilot is on top of the roll bar, the team will be disqualified from the race.

C.7.8. Chassis

- The chassis should be designed in a suitable and secure manner for the connection of systems such as the engine, suspension, steering, and brakes of the vehicle.
- Vehicle chassis can be made of materials such as steel, aluminum, carbon fiber, honeycomb, etc.
- Vehicle chassis must be able to carry the forces coming from the systems to be attached to it and be of appropriate strength.
- During technical inspections, vehicle chassis will be checked, and teams with unsafe equipment will not be allowed to participate in the race.
- If there are any loads in the vehicle that could potentially harm the driver and passengers (e.g., spare tire, charging cable, tool kit, etc.), these loads should be securely fastened to their designated positions inside the vehicle.

C.7.9. Rear View

- It is necessary that on both sides of the cockpit, rear view mirrors with a minimum reflection area of 50 cm² each be provided.
- In the inspections, it will be expected that the text to be shown from behind the vehicle can be seen and read by the driver by means of the mirrors.
- A sign will be placed 5 meters back from the rearmost point of the vehicle and in the middle of the vehicle, and it will be expected that the driver can see the numbers written on this sign. The height of the plate from the ground will be 1 m. The sheet will be in the size of horizontal A4 paper and will have different numbers on it.

C.7.10. Tow Bars

- One steel ring should be provided on the front and rear part of the vehicle with a minimum internal diameter of 20 mm, attached to the chassis, located in an easily accessible manner, painted red or yellow, and easily seen from outside.
- The position of the tow ring should be aligned with the exact center of the axle clearance. It is important to position the tow ring in a way that does not disrupt the vehicle dynamics.

C.7.11. Windscreen, Windows, and Wipers

- Windows that do not shatter during collisions should be used (Plexiglas, polycarbonate, or metal mesh). If glass is used, it should be transparent and should not obscure the sight of the driver.
- There should be windows on both sides of the vehicle to increase the driver's field of vision.
- It is mandatory to have a windshield wiper for the front windshield. However, teams without a wiper can participate with penalty points (see Appendix 2: Penalty List). During technical inspections, the windshield wiper is expected to move continuously at least 5 times, without any assistance, in order to clear the driver's field of vision.

C.7.12. Cockpit

- It should be designed in such a way that it does not tire the driver even in long distances. The main equipment required to drive the vehicle should be designed in such a way that the driver can easily use his body without excessive movement and without loosening the seat belt. The cockpit should be of sufficient form to provide a sufficient amount of fresh air inside.
- Entry and exit should be provided to the cockpit without the need for the assistance of others. In vehicles, the driver must be able to get out of the vehicle without assistance within a maximum of 10 seconds (see Rules Booklet: Emergency Evacuation).

C.7.13. Steering Wheel

- Since the traffic in Türkiye and in the race is from the left, the vehicle should be designed with left-hand drive.
- The steering wheel must be in the form of a closed ring. Open handles, such as in the form of a joystick, are prohibited since these could create problems in the event of an emergency evacuation.
- In technical inspections, the fixation of the steering wheel, its location under the front roll bar, and its capability to be easily rotated will be checked.
- While turning the steering wheel, the steering wheel should maintain its strength and should not be bent, flexion, or twisted.

C.7.14. Vehicle Components with Basic Functions

- Since the teams make the main components specific to their vehicle designs, the Rules Booklet does not contain any detailed information about these parts.
- Control of the main components will be checked according to their performance during the dynamic driving test. The issues related to the main components with basic functions are listed below:
 - i. Braking and drive control devices, load-carrying parts, wheel suspension, and safety belt fixing points; attention should be paid to the quality of such parts. Registered standard parts should be used when possible.
 - ii. Screws should be of sufficient length and should not loosen by themselves.
- If technical checks on parts with basic functions identify situations that risk race and driver safety, regulation will be requested from the teams.

C.7.15. Mitigating the Risk of Injury

- The protrusion of parts inside the vehicle should be avoided. Since sharp or protruding edges will not be permitted, these should be cushioned as much as possible. Sharp ends outside the vehicle should be sufficiently covered or cushioned. Parts of the vehicle that cannot be covered should be marked in yellow and black.
- Parts that constitute a risk for the driver sitting in the vehicle and other vehicles will be checked with a visual inspection.

C.7.16. Horn

- The vehicle should have a certified acoustic horn that sounds continuously for three seconds at a sound level of 80 dB(A).
- In technical inspections, the driver will be requested to sound the horn for 3 seconds; it will be measured with a sound-level meter at a distance of 2 meters.

C.7.17. Speedometer

- There must be a speedometer that will be located within the driver's field of view.
- In technical inspections, the speedometer will be checked while driving in the dynamic control test from the telemetry computer, which is mandatory for the teams.
- Teams can enter the race with a penalty if they cannot show speed information on the telemetry computer if they use a proper external speedometer (Bicycle Speedometer, etc.) (see Appendix 2: Penalty List). It is not permitted to use mobile phones for speedometer purposes.

C.7.18. Break Light and Headlight

- Two brake lights should be placed at the rear of the vehicle that must be seen from a minimum distance of 25 m in daylight, emit a red light, and be activated in the event of a full or half-press of the brake.
- In technical inspections, it will be checked whether the brake lights are easily seen from a distance of 25 m. The brake light should illuminate as soon as the brake pedal is pressed. It is inappropriate to activate the brake light through the button on the brake pedal.
- Two headlights emitting white light should be placed on the front of the vehicle that can be seen from a minimum distance of 25 m in daylight. In technical inspections, it shall be checked whether the two headlights are easily seen from a distance of 25 m. In technical inspections, the driver will be requested to turn on and off the headlights using a button placed in the cockpit.

C.7.19. Reverse Driving

- The vehicle should be able to perform reverse movements with its own driving force. Reversing control should be carried out in dynamic driving control.

C.7.20. Dash Camera

- At least one camera must be placed inside the vehicle to see the cockpit, steering wheel, and road.
- The camera should also have a voice recording feature.
- The camera will supply the energy it needs from the vehicle's battery system.
- The use of an external power supply for the camera is prohibited.
- Camera image quality must be at least 1080p.
- The camera can be fixed to the roll bar.
- End of the race, camera recordings will be uploaded to the sharing site specified by the Jury.
- The date and time of the race must be displayed correctly on the registration screen.

- Camera recording must be started when the race starts and must be terminated before the end-of-race energy measurement.
- Penalty points are given to teams that do not register/upload their race entry (see Appendix 2: Penalty List).

C.7.21. Emergency Evacuation

- Teams that pass the controls of door, seat, safety belt, helmet, racing suit, gloves, and shoes shall satisfy the emergency evacuation test to ensure that the driver can leave the vehicle in case of a dangerous situation during the training laps or the race.
- In the emergency evacuation test, the driver dressed in racing apparel (helmet, racing suit, gloves, and shoes) with seat belts fastened and a person from the team (preferably the reserve driver) with seat belts fastened, the driver's hands are at the steering wheel. They must leave the vehicle upon command in 10 seconds without outside assistance while the vehicle's doors are closed.

C.7.22. Logos

- Teams should attach the logos related to the competition to the sections that will be notified to them by TÜBİTAK. TÜBİTAK distributes the logos to be used during the registration process.
- The logo is checked, and logos should be located in a place where they can be seen from a distance.

C.8. Checklist

- During the race week, teams will be inspected with a checklist based on the rules provided in section C, which outlines the technical details, to determine if they have a safe design.
- Teams with appropriate designs must fulfill all the items specified in this checklist to qualify for participation in the competition. This checklist will be published together with the Technical Design Report Guide in the upcoming process.

D. RACE and RESULT PROCESS

D.1. The Electromobile and Hydromobile Final Race

D.1.1. Track Information: TÜBİTAK Gebze Campus

- 20th International Efficiency Challenge Races will take place at the TÜBİTAK Gebze Campus. There is a total of 9 bends, 3 on the right and 6 on the left on the Racetrack. The length of the track, slope, etc. information is shown in Figure 22. The view of the runway and the slope information are given in Figure 22. The GPS coordinate information will be shared with the teams requesting it.
- Only teams that have completed their technical checks and obtained their stickers can participate in this final race.
- For the final race, teams that have made at least the motor driver of their vehicles domestic using the domestic parts specified in the Domestic Rules Booklet and have completed their technical inspections and obtained their stickers can participate in the International (Electromobile and Hydromobile) category.
- For the final race, teams from high schools can participate in the (Electromobile) category if they have made at least one of the required domestic parts (motor driver, battery pack, or steering system) as specified in the Domestic Rules Booklet, completed the technical inspections, and obtained their stickers.
- For the International Efficiency Challenge to simulate the daily use of electric vehicles in the city, a task that can be performed during the race will be defined:

Task Description:

Race requires the vehicles to complete four laps on the race track within the specified time and wait for a minimum of 10 seconds at a designated pit stop.

- During the race week, the vehicle must complete 4 laps within a maximum of 13 minutes.
- Vehicles must come to a complete stop at the specified stop point and wait for at least 10 seconds. The round where the stop will occur will be indicated during race week.
- When reaching the stop point, the vehicle will come to a complete stop and then start waiting for 10 seconds.
- Vehicles that have completed the specified waiting time will continue safely on the track.
- If a vehicle starts moving without waiting 10 seconds, its racing right is considered invalid.
- Vehicles should have a carrying capacity of 50-100 kg on the passenger seat. This will be done to test the load-carrying ability. In the location specified during the competition week, the person assigned by TÜBİTAK will get into the passenger seat of the car and will get off at the same location in the next round. If the seat is designed by the team domestically, it is expected to be suitable in terms of

ergonomics and durability. The safety equipment of the TÜBİTAK representative will be provided by TÜBİTAK.

- Vehicles that do not comply with the rules will be penalized for violations such as not completing four laps within the specified time or not providing the necessary waiting time at the stop point. In this case, the racing rights of the relevant vehicle will be invalidated.
- TÜBİTAK has the ultimate authority to interpret and enforce the rules. In case of any disputes, the decisions made by TÜBİTAK are final and cannot be changed.

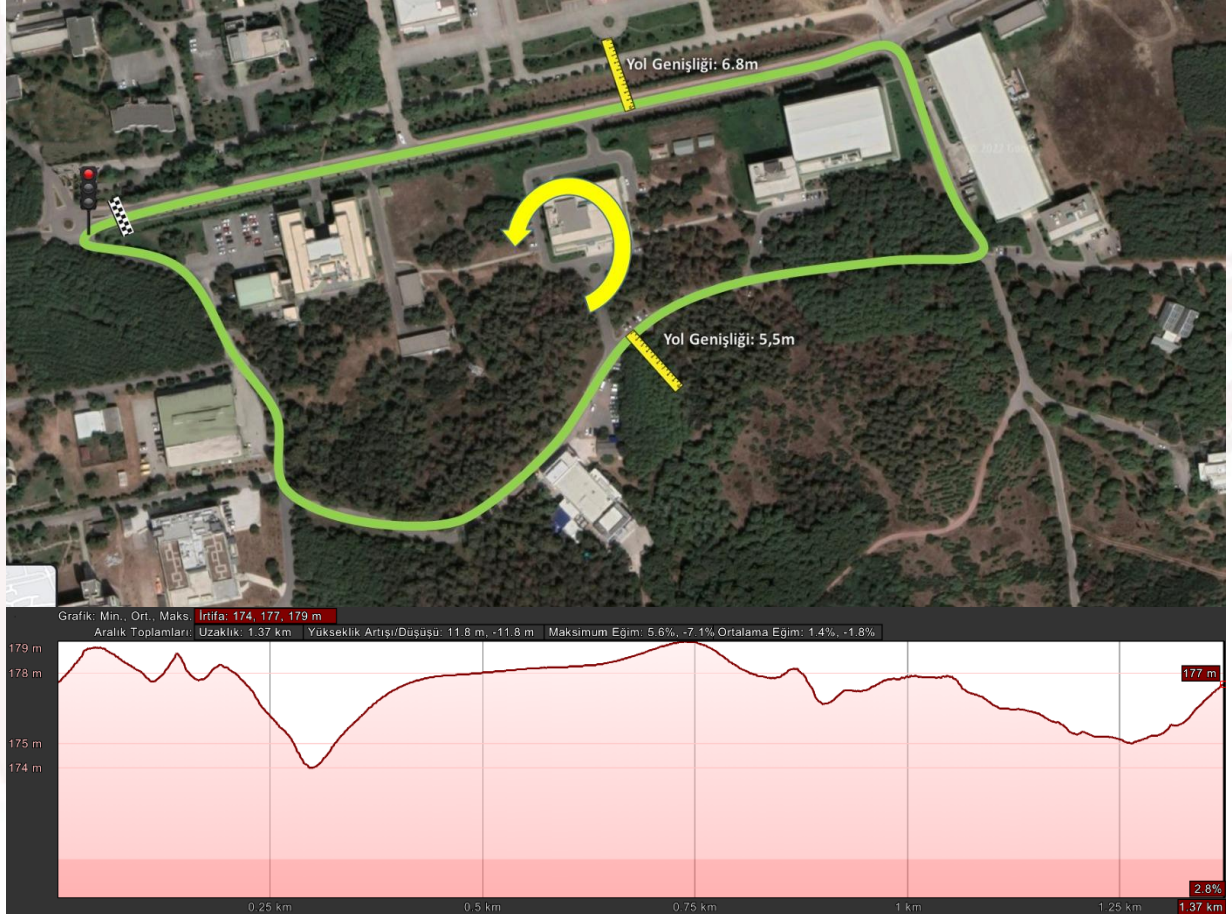


Figure 22. Satellite view and slope information of race circuit.

D.1.2. Electromobile Final Race

- Each vehicle is expected to complete 4 laps within a maximum of 13 minutes. The results of teams that miss laps will be considered invalid. During the evaluation of vehicles, vehicles that complete more laps will be evaluated as completing 4 laps in terms of distance.
- 3 attempts will be given to teams to complete the race. The team's most successful race will be recorded as a valid result.
- The maximum speed limit on the track during practice and final races is set at 50 km/h. All teams must provide accurate speed information with a speedometer in the driver's compartment.

- A maximum of five vehicles shall be on the track at the same time. Vehicles shall start the race at a certain interval determined by the Jury.
- It is not important in terms of final ranking at which rank the vehicle completed the race. The energy measuring device to be given by TÜBİTAK beforehand and attached to the vehicles before the race will be used for the evaluations.
- Teams will not be allowed to make pit stops during the race.
- The ranking at the end of the race shall be calculated based on the score received by teams according to the following formula:

$$X = 1000 - \text{Energy Consumption Value} - \text{Penalty} + \text{Award}$$

Table 4. Example calculation for Electromobile category.

(This table is an example for the case where each vehicle is required to complete 4 laps within a maximum of 13 minutes.)

Vehicle	Number of Laps	Time	Total Energy Consumption	Calculated Score	Notes
	#	min:sec	Wh	X	
1	4	12:00	325	675	Completing early is not important
2	4	13:00	100	900	Vehicle with minimum energy consumption
3	5	13:00	135	865	1 extra lap will not be awarded
4	3	10:00	90	0	Did Not Finish lack of laps (DNF)
5	4	16:00	230	0	Did Not Finish due to time limit(DNF)

Calculating the score of Vehicle-2 in Table 4:

$$X = 1000 - \text{Energy Consumption Value} - \text{Penalty} + \text{Award}$$

$$X = 1000 - 100 - 0 + 0$$

$$X = 900$$

Note: In the calculation, it is assumed that there is no penalty or reward points for the team.

- The formula may change depending on the conditions of the track where the race will take place.

D.1.3. Hydromobile Final Race

- Each vehicle is expected to complete 4 laps within a maximum of 13 minutes. The results of teams that miss laps will be considered invalid. During the evaluation of vehicles, if a vehicle completes more than 4 laps, it will be evaluated as completing 4 laps in terms of distance.
- 3 attempts will be given to teams to complete the race. The team's most successful race will be recorded as the valid result.

- The maximum speed limit on the track during practice and final races is set at 50 km/h. All teams must provide accurate speed information with a speedometer in the driver's compartment.
- A maximum of five vehicles shall be on the track at the same time. Teams can go on track at different times, not simultaneously but at specific intervals.
- It is not important in terms of final ranking at which rank a team completes the race. The energy meter and flowmeter to be fitted to the vehicles before the race will be used by TÜBİTAK for the assessment to be made.
- The ranking at the end of the race shall be calculated based on the score received by teams according to the following formula:

$$X = 1000 - (\text{Energy Consumption Value} + \text{Hydrogen Consumption Value} + |\text{Energy Consumption Value} - 3 \times \text{Hydrogen Consumption Value}|) + \text{Award} - \text{Penalty}$$
- Teams may maximize their scores by drawing balanced energy from the battery and fuel cell.

Table 5. Example calculation for Hydromobile.

(This table is an example for the case where each vehicle is required to complete 4 laps within a maximum of 13 minutes.)

Vehicle	Number of Laps	Time	Total Energy Consumption	Total Hydrogen Consumption	Calculated Score	Notes
	#	min:sec	Wh	Litres	X	
1	4	12:00	150	40	780	Early completion is not important
2	4	12:30	75	25	900	Vehicle with the lowest consumption
3	6	13:00	110	30	840	Last lap will not be valid
4	3	12:45	85	20	0	The score is 0 for failing to complete 4 laps.
5	2	12:50	60	5	0	The score is 0 for failing to complete 4 laps.
6	6	12:55	0	200	200	Excessive laps will not be counted, continuing the race with a single source will result in low scores.

Calculating the score of Vehicle-2 in Table 5:

$$X = 1000 - (\text{Energy Consumption Value} + \text{Hydrogen Consumption Value} + |\text{Energy Consumption Value} - 3 \times \text{Hydrogen Consumption Value}|) + \text{Award} - \text{Penalty}$$

$$X = 1000 - (75 + 25 + |75 - 3 \times 25|) - 0 + 0$$

$$X = 900$$

Note: In the calculation, it is assumed that there is no penalty or reward points for the team.

- Important Note: The formula may change depending on the conditions of the track where the race will take place.

D.1.4. Drag Race

- The drag race will be held after the efficiency race is over, it will take place on the flat part of the race track shown in Figure 23 and its length is 200 meters. Teams that receive mechanical and electrical safety stickers from technical inspections are eligible to participate in the drag race.
- The total motor continuous power (nominal power) of the teams that will enter the competition must be 5 kW at most. Vehicles with a total engine power of more than 5 kW will not be able to participate in the drag race.
- After receiving the "eligible to participate in the race" label by completing the technical inspection process, a team is prohibited from changing the parts on the electric vehicle, regardless of the type of race (Final Race (performance), Drag Race).

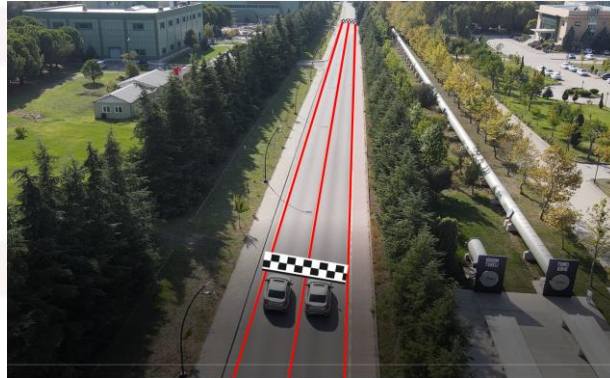


Figure 23. Drag race track.

D.1.5. Number and Time of Laps

- The Electromobile and Hydromobile vehicles are expected to complete 4 laps within a maximum of 13 minutes. Any extra laps completed by a team will not be taken into account. Teams completing fewer than 4 laps will be evaluated with a score of 0 (zero) and will be considered to have used one race opportunity.
- In order to be able to finish the race, the teams must complete the race in the pit area, and the vehicles unable to drive up to the pit area cannot be ranked.
- The number of laps and times taken by the teams in the race will be measured. Any objections regarding the number of laps and time after the race will be evaluated by TÜBİTAK.

D.1.6. Determining the Ranking

- The initial value of the energy measuring devices of all vehicles before the start of the race and the final values when the race is completed shall be read and recorded by the TÜBİTAK.
- The team that performs the most tasks is ranked higher among two teams with the same competition score, which is calculated taking into account the energy consumption, reward, and penalty points. If the number of tasks performed is also the same, the vehicle that completes the race in the shortest time earns the right to be placed higher.
- The score received by the teams shall be used for the final ranking according to the formula explained above.

D.2. Race Week

- The activity draft plan for the race week with the upcoming competition this year is provided in Table 6.
- TÜBİTAK reserves the right to organize and modify the relevant activity dates.

Table 6. Draft race week schedule.

1st Day	Registration (09.00-15.00)
2nd Day	Technical Inspection-I + Dynamic Driving Test (09.00-12.00/13.00-18.00)
3rd Day	Technical Inspection-II + Dynamic Driving Test (09.00-12.00/13.00-18.00)
4th Day	Technical Inspection-III + Dynamic Driving Test (09.00-12.00/13.00-18.00)
5th Day	1st Day Races (09.00-12.00/13.00-18.00)
6th Day	2nd Day Races (09.00-12.00/13.00-18.00)
7th Day	3rd Day Last Chance Final Races (09.00-12.00/13.00-18.00)
8th Day	Drag Race + Award Ceremony + Closing (09.00-12.00/13.00-18.00)

❖ **First Day:**

- Teams will place their vehicles at their stands in the race area between 09:30 and 17:00. On this date, no work will be allowed in the booth area. Except for the specified days and hours, vehicles will not be accepted in the area unless there are force majeure reasons.
- On the first day of the race, registration is made between 09:00-17:00 with the participation of all members in the field. Registration is not available on other days. During registration, each team member will be asked to submit a signed responsibility commitment form from the team captain. The document format will be provided to the teams. There should be no team members who do not deliver their commitment letter, and the responsibility for control lies with the team captain.
- During the race week, all members in the field are required to carry their official and student ID cards with them.

❖ **Second Day:**

- During the race week, teams will have a total of 3 attempts to successfully pass the Technical Inspection and Dynamic Driving Test.
- The appointment times for the teams to use their First Technical Inspection and Dynamic Driving Test rights will be notified via email at the end of the First Day.
- If the team does not use the allocated appointment time for Technical Inspection and Dynamic Driving Test, it is assumed that the team has used this right.
- If the team fails the first Technical Inspection and Dynamic Driving Test, they can use their Second Technical Inspection and Dynamic Driving Test opportunity on the Third Day with penalty points added. (see Appendix 2: Penalty List)
- If the team fails the Dynamic Driving and Braking tests, they will not be able to proceed to the other technical checks (mechanical, vehicle safety, battery packaging, battery management system, vehicle control system, telemetry, motor, hydrogen system, energy management system, onboard charger unit, insulation monitoring device, motor driver, etc.).
- Teams that pass the Dynamic Driving and Braking tests successfully will be taken to the technical control garage for detailed Technical Control.
- Dynamic Driving Test and Technical Inspection are inseparable. If a team passes the Dynamic Driving Test but does not participate in the Technical Inspection step afterwards, they will be considered as having failed and utilized their right to participate in that day's Technical Inspection and Dynamic Driving Test.
- Teams that fail the Dynamic Driving Test will not be able to participate in the race as they will not be eligible for detailed Technical Control.
- The vehicle taken to the Technical Control Area for Dynamic Driving Test and Technical Inspection shall not be intervened by the team in any way until the completion of the Technical Inspection Process. If the team interferes with or attempts to interfere with the vehicle, the Technical Inspection Process of the

relevant team will be terminated. The team will be considered as failed and having used its right for the current Technical Inspection and Dynamic Driving Test.

- A sticker will be attached to vehicles that have successfully completed the Technical Control Process, indicating that they can participate in the races. Vehicles with the sticker can take a practice lap on the main track during the designated hours.
- After registration, vehicles (including chassis, body, wheels, etc.) must be present at the team stand from 19:30 to 08:00 every day until the end of the races. Team stands will be checked during these hours every day, and teams whose vehicles are not at the stand will be disqualified. If the vehicle is found outside the race area during this time frame, the team will be disqualified.

❖ **Third and Fourth Days:**

- The appointment times for teams to use the Second Technical Inspection and Dynamic Driving Test on the Third Day rights will be notified via email at the end of the Second Day.
- The appointment times for teams to use the Third Technical Inspection and Dynamic Driving Test on the Fourth Day rights will be notified via email at the end of the Third Day.
- If the team does not use the allocated appointment time for Technical Inspection and Dynamic Driving Test, it is considered that the team has used this right.
- The Technical Inspection and Dynamic Driving Test procedure conducted on the Second Day is valid for the Third and Fourth Days.
- At the end of the Fourth Day, when the entire Technical Control Process is completed, a team list will be created for participation in the race.

❖ **Fifth Day:**

- Teams that successfully complete the Technical Control Process and receive a sticker will have 3 race rights.
- The appointment times for the First Day Race for the team to use their right on the Fifth Day will be communicated via email at the end of the Fourth Day.
- If the team does not use their First Day Race right at the assigned appointment time, it is considered that the team has used this right.
- The hours at which teams will have the right to race are determined by TÜBİTAK.

❖ **Sixth and Seventh Days:**

- The appointment times for the Sixth Day, for the team to use their Second Day Race right, will be communicated via email at the end of the Fifth Day.
- The appointment times for the Seventh Day, for the team to use their Second Day Race right, will be communicated via email at the end of the Sixth Day.

- The race organization procedure carried out on the Fifth Day is valid for the Sixth and Seventh Days.

❖ **Eight Day:**

- On the Eighth Day, teams that have successfully completed the Dynamic Driving and obtained the electrical and mechanical safety sticker will have the option to participate in the Drag Race on the designated track.
- At the end of the Seventh Day, the final list of teams participating in the Drag Race event will be created.
- In the Drag Race event, a Single Elimination System will be used where the loser of each race will be immediately eliminated from the event.
- The schedule and fixtures of the Drag Race event on the Eighth Day will be notified via email at the end of the Seventh Day.

❖ **General Rules:**

- The teams' point evaluation is done based on the Technical Inspection they enter.
- It is prohibited to perform any technical work in the technical control area. If detected, the technical control process will be terminated, and the team will be deemed to have failed the Technical Control.
- Teams bring a copy of the Technical Design Report (in electronic and printed format) to the technical inspection area. The Technical Inspection is conducted taking into account the Technical Design Report. Teams that do not bring the Technical Design Report are asked to provide detailed information from the members taken to the garage.
- The success of obtaining the "sticker" in the first technical check is rewarded. (see Appendix 3: List of Awards).
- Removing the sticker or changing the parts that contain the sticker before the race is prohibited for teams that have passed Technical Inspections and have received the sticker.
- Teams will have the right to participate in 3 races (efficiency race) during the race week. Teams that successfully complete the technical inspection will be granted permission to enter the race track at 30-second intervals. At most, five teams can race on the track simultaneously.
- In races where the number of laps is not completed (incomplete 4 laps), the race right is considered invalid. The race final ranking is determined based on the best score teams obtained in race week at the 3 race right.
- Accommodation and transportation information for the teams during the race week will be announced on the www.teknofest.org web page.
- Vehicles should be designed to be able to undergo Technical Inspection and participate in races in weather conditions such as occasional rain, light rain, or drizzle.

- If no other announcement has been made by TÜBİTAK, vehicles with appointments in weather conditions such as occasional rain, light rain, drizzle can undergo Technical Inspection, and appointments for teams racing on the track are not canceled.
- In common areas where the team campus is located, it is mandatory for vehicles to be moved without starting the engine (by pushing) for security and safety reasons.
- Teams or team members who are found to violate the administrative, sportsmanship, and ethical rules of the race during the race week may be subject to penalty points or penalties such as disqualification from the race, imposed by TÜBİTAK.
- Teams that do not comply with the security and driving rules determined by TÜBİTAK, neglect the necessary precautions that endanger the race safety, and/or deliberately do not take them may be subject to warnings, invalidation of race points, or elimination from the races.
- The team captain is responsible for the management of team stalls, the work done, and all materials delivered to the stand. Any production, repair, etc. work that does not comply with occupational health and safety standards is not allowed in the stand.
- Teams' vehicles must arrive ready for the race. Teams' work at the stands should only be done to complete any deficiencies that arise during Technical Inspections or afterwards.
- TÜBİTAK aims to ensure the safety of the race and drivers by conducting unannounced technical inspections on vehicles if necessary during the race week.
- Teams must undergo Technical Inspections for the purpose of using the test track for testing, apart from the race, and obtain the stickers determined by TÜBİTAK.
- TÜBİTAK can update the calculation formulas when necessary.
- TÜBİTAK can update the number and duration of tours if necessary.
- TÜBİTAK has the right to make any necessary updates to the race week schedule content when necessary.
- During the race week, teams have the right to submit a maximum of 3 objection petitions signed by the team captain. A second petition on the same subject will not be accepted. Petitions are evaluated and decided by TÜBİTAK. Decisions are communicated to the team captain email of the team.
- After the race, the vehicles are registered in the university/institution where the team captain is a student in order to be developed in the coming years.

APPENDIX

Appendix 1: Unsuitable Design Examples



Figure A. Single-center brake system, brakes only on both front wheels, brake hoses not fixed, example of an unsuitable brake design.



Figure B. There is a gap between the door and the body, an example of inappropriate door design.

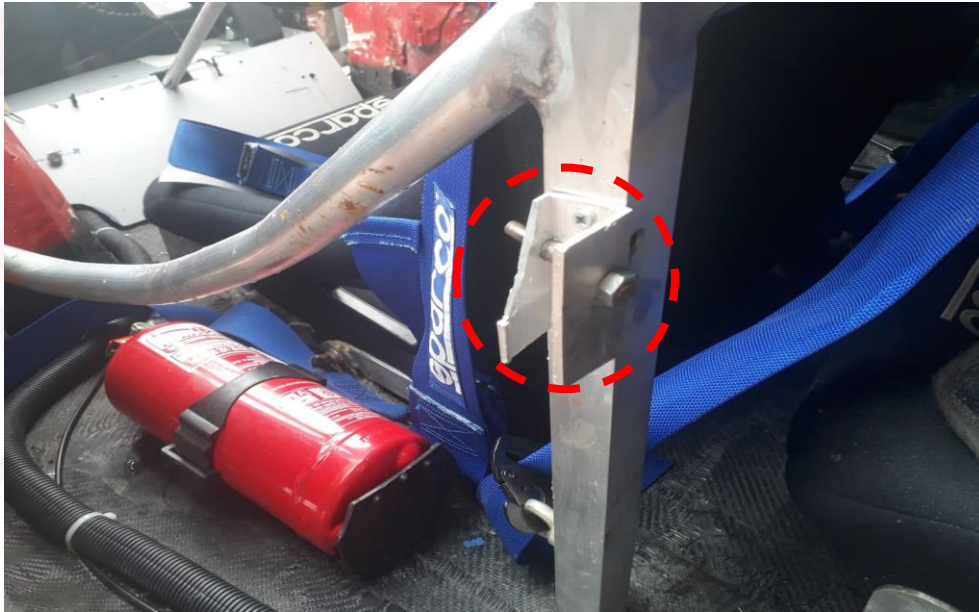


Figure C. There is a sharp-edged plate in the cockpit that will risk the driver's safety, there is a bolt tip in the cockpit, an example of inappropriate cockpit design.



Figure D. The cockpit and the outside environment are not properly isolated, the pilot does not have enough protection against the external environment during the race, there is not enough protection between the wheels and the pilot, an example of inappropriate cockpit design.



Figure E. Bolt heads protruding beyond the rim, cable likely to be broken by bolts, an example of inappropriate wheel design.



Figure F. Roll bar elements are combined with bolts, there should be welded joints at points that cannot be twisted, bolted jointing can only be used in the chassis and roll cage connection, an example of unsuitable roll Bar design

Appendix 2: Penalty List

TITLE		BREACHES	ELECTROMOBILE	HYDROMOBILE
DESIGN PROCESSES	Progress Report	Not sending the Progress Report	Disqualification	Disqualification
	Technical Design Report	Not sending the Technical Design Report	Disqualification	Disqualification
	Dynamic Driving Test Video	Failure of the video to upload or failure to meet any or all of the expected features expressed in the rulebook.	Disqualification	Disqualification
	Braking Test Video	Failure of the video to upload or failure to meet any or all of the expected features expressed in the rulebook.	Disqualification	Disqualification
RACE WEEK PROCESS	Dynamic driving test	Failure to complete the dynamic driving test on the first day	5 Wh	5 Wh
	Dashboard camera	No video recording during the race/ Not uploaded to the system	2.5 Wh	2.5 Wh
VEHICLE OUTSIDE CONTROLS	Vehicle dimensions	Not suitable for the dimensions specified in the rules	2.5 Wh for each violated cm	2.5 Wh for each violated cm
		The ground clearance of the vehicle is not at least 10 cm	Disqualification due to the security reasons	Disqualification due to the security reasons
		Vehicle height is more than 1.25 times vehicle width	Disqualification due to the security reasons	Disqualification due to the security reasons
		Wheel span is less than half of the vehicle width inside	Disqualification due to the security reasons	Disqualification due to the security reasons
	Vehicle body	Open place with a bird's eye view, wheels are outside the vehicle	Disqualification due to the security reasons	Disqualification due to the security reasons
		Fragile windows/sharp corners/dangerous protrusions and similar problems	Disqualification due to the security reasons	Disqualification due to the security reasons
		No cover on the front/back of the shell to access the battery	Disqualification due to the security reasons	Disqualification due to the security reasons
		No cover on the front / back of the shell for access to other parts	5 Wh	5 Wh
	Vehicle doors and mechanisms	50x80 cm frame cannot pass	Disqualification due to the security reasons	Disqualification due to the security reasons
		Preventing the driver from exiting the vehicle in case the vehicle turns upside down or leans on its side.	Disqualification due to the security reasons	Disqualification due to the security reasons
		Does not comply with the dimensions specified in the rules	Disqualification due to the security reasons	Disqualification due to the security reasons
		The door cannot be closed without using the handle, but it is safe	5 Wh	5 Wh
		The door cannot be opened from the outside, there is a risk of opening during the race.	Disqualification due to the security reasons	Disqualification due to the security reasons
		After the race, it is determined that the door is glued with duct tape / fastened with plastic clamps from the inside	Disqualification due to the security reasons	Disqualification due to the security reasons
	Vehicle rear view mirrors	Non / Only one	Disqualification due to the security reasons	Disqualification due to the security reasons
		Areas less than 50 cm ²	Disqualification due to the security reasons	Disqualification due to the security reasons

TITLE		BREACHES	ELECTROMOBILE	HYDROMOBILE
		The driver cannot see the text shown	Disqualification due to the security reasons	Disqualification due to the security reasons
	Vehicle towing eye	No towing eye	Disqualification due to the security reasons	Disqualification due to the security reasons
		Inner diameter less than 20 mm/Non steel	Disqualification due to the security reasons	Disqualification due to the security reasons
	Vehicle taillight	None/Cannot be seen from 25 m	Disqualification due to the security reasons	Disqualification due to the security reasons
	Vehicle headlights	Non	5 Wh	5 Wh
		Cannot be seen from 25 m	2.5 Wh	2.5 Wh
	Vehicle windshield	The material does not comply with the rules, it is not transparent	Disqualification due to the security reasons	Disqualification due to the security reasons
	Windscreen wiper	Non	5 Wh	5 Wh
		Available but not working properly	2.5 Wh	2.5 Wh
VEHICLE INSIDE CONTROLS	Vehicle tire	Using tires other than those supplied by TÜBİTAK	Disqualification due to rule violation	Disqualification due to rule violation
	The tire pressure of the vehicle	Being over the specified limit value	Disqualification due to the security reasons	Disqualification due to the security reasons
	Cockpit	Not enough space/unsafe for the driver	Disqualification due to the security reasons	Disqualification due to the security reasons
	Seat belt	Not secured by at least 5 points or not compliant with FIA rules	Disqualification due to the security reasons	Disqualification due to the security reasons
		No passenger seat belt or not in compliance with FIA regulations	Disqualification due to the security reasons	Disqualification due to the security reasons
	Roll bars	Missing roll bar	Disqualification due to the security reasons	Disqualification due to the security reasons
	Roll cage	Tensile strength less than 200 MPa	Disqualification due to the security reasons	Disqualification due to the security reasons
		Roll bar not perpendicular to vehicle floor	Disqualification due to the security reasons	Disqualification due to the security reasons
		Front roll bar does not start at least 3 cm above the steering wheel	Disqualification due to the security reasons	Disqualification due to the security reasons
		Rear roll bar does not start at least 5 cm above helmet level	Disqualification due to the security reasons	Disqualification due to the security reasons
		Profile does not follow the rules	Disqualification due to the security reasons	Disqualification due to the security reasons
		The roll cage is not independent of the body and is not safe	Disqualification due to the security reasons	Disqualification due to the security reasons
		The roll cage is not independent of the body, but it is safe	5 Wh	5 Wh
		Welding or bolt not properly fixed	Disqualification due to the security reasons	Disqualification due to the security reasons
	Fire extinguisher	Less than 2 kg	Disqualification due to the security reasons	Disqualification due to the security reasons
	Seat	Vertical angle more than 30°	Disqualification due to the security reasons	Disqualification due to the security reasons
		There is a seat, no passenger seat	Disqualification Due to Rule	Disqualification Due to Rule
		Not have FIA standards, not safe	Disqualification due to the security reasons	Disqualification due to the security reasons

TITLE		BREACHES	ELECTROMOBILE	HYDROMOBILE
		Not have FIA standards, but safe	2.5 Wh / seat	2.5 Wh / seat
		Distance between adjacent seats is less than 90 mm	Disqualification due to the security reasons	Disqualification due to the security reasons
	Steering wheel	Open form	Disqualification due to the security reasons	Disqualification due to the security reasons
	Horn	Not play for 3 seconds without interrupt	Disqualification due to the security reasons	Disqualification due to the security reasons
	Speedometer	Non / not working	Disqualification due to the security reasons	Disqualification due to the security reasons
		Cannot be displayed on telemetry computer but external speedometer is used	1 Wh	1 Wh
	Foot Accelerator Pedal	Non / not working	Disqualification due to the security reasons	Disqualification due to the security reasons
SECURITY CONTROLS	Driver suit and equipment	Unsuitable due the rules	Disqualification due to the security reasons	Disqualification due to the security reasons
		Not FIA standards, but safe	2.5 Wh	2.5 Wh
	Brake test	Not enough	Disqualification due to the security reasons	Disqualification due to the security reasons
	Brake system	Not multi-circuit or hydraulic	Disqualification due to the security reasons	Disqualification due to the security reasons
	Electrical cable connections	Open connection / no isolation	Disqualification due to the security reasons	Disqualification due to the security reasons
	Emergency stop button	Non / not working	Disqualification due to the security reasons	Disqualification due to the security reasons
	Overcurrent circuit breaker	Non / Improper design	Disqualification due to the security reasons	Disqualification due to the security reasons
	Battery	Non	Disqualification due to rule violation	Disqualification due to the security reasons
	Battery management system	Non / not working	Disqualification due to the security reasons	Disqualification due to the security reasons
	Battery management system	Temperature sensors not properly placed in battery	Disqualification due to the security reasons	Disqualification due to the security reasons
	Battery management system	Temperature sensors not working	Disqualification due to the security reasons	Disqualification due to the security reasons
	Battery management system	Balancing system not working	0.5 Wh	0.5 Wh
	Battery management system	State of charge (SOC) calculation is incorrect	0.5 Wh	0.5 Wh
	Battery temperature measurement	No flasher and temperature indicator	Disqualification due to the security reasons	Disqualification due to the security reasons
	Battery box	Non / unsuitable design & materials	Disqualification due to the security reasons	Disqualification due to the security reasons
	Battery box fixing	Unfixed	Disqualification due to the security reasons	Disqualification due to the security reasons
		Screw thinner than 8 mm is used		
	Safety curtain	No safety curtain between driver's seat and battery pack	Disqualification due to the security reasons	Disqualification due to the security reasons
	Energy meter connection	Has an external battery supply	(Battery capacity) Wh	(Battery capacity) Wh
	Energy meter	Battery voltage levels are outside the capacity of the energy meter	Disqualification due to rule violation	Disqualification due to rule violation

TITLE		BREACHES	ELECTROMOBILE	HYDROMOBILE
	Onboard charge unit	No electrical isolation between grid and battery pack	Disqualification due to the security reasons	Disqualification due to the security reasons
	Telemetry	Non / unsuitable	Disqualification due to rule violation	Disqualification due to rule violation
	Fuel cell	Non/not working/greater than 3 kW		Disqualification due to the security reasons
	Super capacitor	Greater than 110 kJ		Disqualification due to the security reasons
	Pressure relief valve	Non / unsuitable		Disqualification due to the security reasons
	Gas outlet safety valve	Non / unsuitable		Disqualification due to the security reasons
	Thermocouple	Non / unsuitable		Disqualification due to the security reasons
	Flasher	Non / unsuitable		Disqualification due to the security reasons
	Temperature indicator	Not connected with flasher		Disqualification due to the security reasons
		Not working/low sound level		Disqualification due to the security reasons
	Metal hydride cylinders	Inside the cockpit / unsuitable		Disqualification due to the security reasons
		No protection shield		Disqualification due to the security reasons
		Unsafe connection		Disqualification due to the security reasons
	Hydrogen line	Inside the cockpit / unsuitable		Disqualification due to the security reasons
		Unsuitable design		Disqualification due to the security reasons
	Ball valve	Non / unsuitable		Disqualification due to the security reasons
		Unsuitable materials		Disqualification due to the security reasons
	Hydrogen sensor	Non / unsuitable		Disqualification due to the security reasons
	Emergency evacuation (driver and co-driver)	More than 10 sec / Help needed	Disqualification due to the security reasons	Disqualification due to the security reasons
	Motor Driver	Unboxed	Disqualification due to the security reasons	Disqualification due to the security reasons
		Plug connectors not used	1 Wh	1 Wh
	Insulation Monitoring Device	Non / not working / low sound level	Disqualification due to the security reasons	Disqualification due to the security reasons
	Electrical Safety	The cross section of the cable not being in accordance with the rules in the specification	Disqualification due to the security reasons	Disqualification due to the security reasons

Appendix 3: Awards List

		CRITERION	ELECTROMOBILE	HYDROMOBILE
RACE WEEK PROCESS	Technical inspections	Receiving a sticker at the first technical check	3 Wh	3 Wh

