



STEAM EDUCATION

**GRAND
PRIX** PRO

OFFICIAL RULEBOOK 2022/2023



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GENERAL RULES AND CONDITIONS

H2GP PRO aims to promote student-oriented racing. Any unruly, violent or unsportsmanlike conduct will therefore not be tolerated.

Teams judged by the Race Officials or Race Director to be in violation of the spirit of this rule will be disqualified and be required to leave the race area. This rule applies also to all visitors at any H2GP PRO event.

H2GP PRO is an international series of student competition races, that distinguish three different tiers: qualifiers – national/state – world.

The race time length for a H2GP event is between 2 – 6 hours. The exact length of the national race will be announced 3 months in advance by the local Race Director. The length of the world final race is 6 hours.

The maximum teams allowed on one racetrack is limited to 20. This rule applies to all race tiers. In case of more teams, the race event should include additional races.

Clarification of all rules and conditions can be made with the local Race Director prior to the event or anytime at: support@h2gp.com

COMPETITION RULES

H2GP PRO is an international series of student competition races. In order to secure fair condition across our growing community, the following format has been established:

STATE/NATIONAL QUALIFIERS

- Subject to the rules in this rulebook in full extend.
- The number of teams is limited to 20/race.
- A maximum of 20 teams will qualify to the next race tier.
- Qualification standards will be announced a minimum of 60 days before the race event.
- Top teams will be **directly qualified – Q** to the next race tier.
- Other teams can be **additionally qualified – q** based on their overall results according the qualification key valid in your region*.

NATIONAL/STATE FINALS

- Subject to the rules in this rulebook in full extend.
- The execution of the H2GP event undergoes the full responsibility of the regional Race manager.

WORLD FINALS

- Subject to the rules based on this rulebook and agreed by international jury.
- The rules for the international competition, qualification key and location will be announced at least 6 months in advance.

**The exact number of the teams that will be additionally qualified/qualification key to the national/state finals will be announced once the final number of the Teams attending is confirmed by the regional Race manager, or, at least 2 months in advance.*

AWARDED CATEGORIES

ENDURANCE

Award is dedicated to the team with **the most laps after the race**.

ENERGY

Award is dedicated to the team, **with lowest consumption of hydrogen**, i.e. team, that finishes the race with the most laps and as few Hydrostiks as possible.

DESIGN

Award is dedicated to the team, whose **body and overall design** was chosen by the jury as the best.

INNOVATION

Award is dedicated to the team, that used **modifications or innovative features** found by the jury to be the most **advanced**.

PROMO

Award is dedicated to the team, whose **oral presentation** was chosen by the jury as the most engaging and well explained.

PIT STOP

Award is dedicated to the best organized team, i.e. the team with the best cooperating mechanics **during a fuel change**.

AWARDED CATEGORIES

CATEGORY	AWARD	CRITERION
ENDURANCE	1. place 2. place 3. place	The total number of laps after the race.
ENERGY	1. place	The total number of laps / used Hydrostiks
DESIGN	1. place	The best score from expert jury: 80% overall look 20% own fabricated body
INNOVATION	1. place	The best score from expert jury: 80% oral presentation 20% technical report*
PROMO	1. place	The best score from expert jury: 80% oral presentation 20% video**
PIT STOP	1. place	The quickest cooperating team during time-controlled fuel change.

***Technical report** in the range of maximum 3 A4 pages including pictures, submitted electronically at least one day before the race.

****Video** in the maximum length of 60 seconds and .mp4 format, can be submitted on the day of the race for evaluation by an expert jury.

Please note that all awarded categories are part only for state/national/world level races. All regional races serve as qualifiers for state/national finals, therefore only the endurance category is awarded.

VEHICLE DESIGN RULES

GENERAL

- All vehicles must comply with the dimensional requirements contained in this rulebook
- All vehicles must use **H-Cell 2.0 and Hydrostiks/Hydrostiks PRO**, other types of fuel cells and hydrogen storage are not permitted.
- Modification or customization of H-Cell 2.0 is allowed but it will void the warranty, it is recommended to be first consulted with the Race director.
- Modification or use of own fuel cell controller is allowed but it will void the warranty of H-Cell 2.0, it is recommended to be first consulted with the Race director.
- It is the team's responsibility to provide details about the customization of H-cell 2.0 if required during technical inspection.
- All vehicle parts, batteries, Hydrostiks, and the H-Cell 2.0 must be securely mounted
- Telemetry is allowed.
- The use of electronic gyroscopes is not allowed.
- Hazardous bumpers, nerf bars, chassis extensions or other objects protruding from the vehicle are not allowed.
- The provided chassis can be used but is not required. You may customize, build or use any chassis that meets the dimensional requirements.
- Multiple chassis at the racing venue are strictly forbidden. Each team can bring spare parts for their chassis. All vehicle parts except for the chassis plate can be replaced during the race. The race chassis plate will be marked by the Race director upon the initial technical inspection.

VEHICLE DESIGN RULES

DIMENSIONAL PARAMETERS

During a technical inspection, the car will be checked as one whole piece. All parameters must remain unchanged throughout the race.

List of allowed dimensional parameters is given in **millimeters or grams** in the following table:

DIMENSION	MINIMUM	MAXIMUM
Vehicle Length	360	470
Vehicle Width	180	220
Vehicle Height	-	-
Wheelbase	230	270
Vehicle Weight (g)	1000	2000
Ground Clearance	4	-
Front Wheel Diameter	60	66
Front Wheel Width	20	30
Rear Wheel Diameter	60	66
Rear Wheel Width	20	55

- All car dimensions are measured including the car body.
- Car weight is measured as a weight of ready-to-race car without the fuel, i.e., excluding Hydrostik(s) and battery.
- Dimensions of the wheels are measured including tires (natural wear of the tire can be tolerated after the race).

VEHICLE DESIGN RULES

ENERGY LIMITS

The teams are allowed to use energy stored only in batteries and Hydrostiks. The maximum allowed energy is defined below, with regards to the race tier:

RACE TIER	RACE LENGTH	MAXIMUM ALLOWED ENERGY	
		BATTERIES*	HYDROSTIKS
QUALIFIERS	2 hrs	52** / 30 Wh	10
	3 hrs	78** / 55 Wh	12
STATE NATIONAL WORLD	4 hrs	78** / 55 Wh	18
	6 hrs	104** / 82 Wh	22

*Watt Hour is calculated by Nominal Voltage multiplied by the Battery Capacity
 $Wh = V \times Ah$,
 example: 55 Wh corresponds to 2S 7200 mAh or 2x 2S 3600 mAh LiPo/LiHV

**This limit applies only to NiMH batteries. Use of the NiMH batteries is limited to provided 6-cell, 7.2V, 3600 mAh batteries.

HYDROSTIKS

- Each team must bring charged Hydrostik cartridges to the race, and hand them over to the Race Director during the technical inspection before the race.
- If the Race Director provides Hydrostiks, all teams are obliged to use them. Teams will be provided with a datasheet on the day of the race.
- Recharging of Hydrostiks during the race is strictly prohibited and will lead to team disqualification.
- Any modifications of Hydrostiks are not permitted. Modifications are allowed to the holders and tubing only.

VEHICLE DESIGN RULES

BATTERIES

- Each team must use batteries in the form:
 - a) Nickel-Metal Hydride (NiMH)
 - b) Lithium Polymer (LiPo/LiHV)
 - c) Lithium Iron Phosphate (LiFePo)
 - d) Lithium-ion (Li-Ion)
- Other types of batteries are not allowed. Teams must use only one selected battery class throughout the race.
- Total energy stored in batteries in Wh cannot be exceeded (0,1% tolerance).
- All batteries must be charged prior to Inspection.
- Any battery found to be overcharged will not be tolerated:
 - a) NiHM - nominal voltage is 1.2V/per cell and max charge is 1.43V
 - b) LiPo - nominal voltage is 3.7V/per cell and max charge is 4.2V.
LiHV - nominal voltage is 3.8V/per cell and max charge is 4.35V
 - c) LiFe - nominal voltage is 3.3V/per cell and max charge is 3.6V
 - d) Li-Ion - nominal voltage is 3.7V/per cell and max charge is 4.2V
- Recharging batteries during the race is strictly prohibited and will lead to team disqualification.
- All „practice“ or other batteries not used for the race will be collected by the race personnel for the duration of the race.
- All batteries must have hardcase protective cover. In case of use of Li-Ion batteries, the car must be equipped with a battery holder case, only a combination of single-cell batteries or commercially available multipacks are allowed. Soldering multiple Li-Ion batteries is not permitted.
- All batteries must have original stickers and clearly visible information about battery type and capacity. Any battery that is suspected of being tampered with in any way will be confiscated at any time by the race director.
- If any team has intentionally tried to switch stickers or disguise a higher capacity battery, that team will be disqualified immediately from all aspects of the H2GP PRO competition.

VEHICLE DESIGN RULES

BODY

- Sharp or otherwise dangerous parts or features on a body are not permitted.
- All vehicles must have a readily removable body. The body and chassis must always be securely joined while the vehicle is on the track. Rubber bands or zip ties are not allowed for this purpose.
- Multiple bodies are not permitted, all vehicles must finish the race with the same body they started with.
- If a body comes off a vehicle during a race, the vehicle must be taken off the track and the body properly replaced before the car may enter back into the race.
- A body can be made of Lexan, plastic or any durable material (Bodies not using Lexan or Plastic must be approved by the race director prior to the race) and formed by 3D printing, injection molding, or vacuum forming but must meet all dimensional requirements.
- Hard bodies made out of materials such as wood and metal are not permitted.
- Cutting holes in the body is only allowed for the wheel wells, antenna, and body posts. Any other holes (e.g. for air ventilation) cannot exceed a total area of 2cm² and must be covered by mesh.

BUMPERS

- Front bumpers are required, they must be shock absorbing and non-metallic with no sharp edges. For safety, rigid bumpers, such as fiberglass and composites are not permitted.
- Front bumpers must be of at least 1/8" (3mm) material thick. Bumpers will not extend forward of the body. The bumper may not extend to the side beyond the outer edge of the tires.
- Rear bumpers are allowed and must be made of shock absorbing material with rounded edges and may not extend to the side beyond the outer edges of the tires and may not extend beyond the rearmost part of the body.

VEHICLE DESIGN RULES

RADIO

- Radio control systems are limited to 2.4GHz DSM/DSS Systems.
- Transmitters are limited to the manufacturer's recommended voltage. External transmitter battery packs are not permitted.

MOTOR

- Brushed or brushless motors are allowed.
- There is no limitation to motor turns, but 17.5t, 21.5t, or 25.5t motors are recommended. Other motors are also allowed but must be cleared with race director.

WINGS & SPOILERS

Wings are aerodynamic devices attached to vehicles to increase downforce and traction when a vehicle is traveling at speed.

For the purposes of these rulebook, a spoiler is a flat plate attached to a body or to the trailing edge of a wing.

- Wings or spoilers can not extend beyond the width and height of the body (i.e. wings or spoilers can not be wider or taller than the car).
- Wings must be mounted to the rear of the car using at least 2 screws

WHEELS & TIRES

Driven wheels are not specified. It is up to student's decision whether their vehicle will be rear/front 2WD or 4WD.

- Rubber or/and Foam tires are allowed.
- The use of any tire treatment product for increasing the traction is prohibited.

Rubber: A tire molded using rubber or similar synthetic material. Tires may be smooth, spiked, or treaded.

Foam: A tire composed solely of foam rubber. Tires may be bonded to the wheel.

RACE DAY RULES

DAY SCHEDULE

All H2GP PRO races will follow the same day format, however the exact day schedule may differ from race to race. Final day schedule will be announced by the Race director or organizer at least one month prior the event:

PRIOR THE RACE

- Teams registration 15 minutes
- Driver's practice/Open track 30 minutes
- Technical check, battery and Hydrostik collection 60 minutes
- Drivers Information meeting 10 minutes

DURING THE RACE

- Race 2 – 6 hours
- Technical check 1 – 3 minutes

AFTER THE RACE

- Technical check 15 minutes
- Award ceremony 30 minutes

RACE DAY RULES

TEAMS REGISTRATION

- All teams must first approach the Race director/registration desk when entering the venue. Teams will receive all information about the day schedule, allocated team space, etc.

PRACTICE

- All teams must wait until the track is officially open for practice. All teams will have a sufficient amount of time for the practice and final preparation of the car.
- Driving outside of the track or on a closed track is strictly permitted.

TECHNICAL CHECK

- All vehicles must pass technical check prior to and after every race. Any vehicle found to be illegal during a pre-race check will not be allowed to race until all violations are corrected. Vehicles found to be illegal during a post-race check will be disqualified.
- All teams must submit charged batteries and Hydrostiks at technical check.
- Technical check includes but is not limited to checking the vehicle's height, length, and width. No other parts of the car other than the tires may be at less than the minimum ground clearance for a specific class.
- No further tolerance is allowed above any maximum specification for all dimensions.
- All vehicles must have the correct number assigned to them by the Race Director and attached in a visible spot of the body, preferably on the roof.
- The designated Official, Technical Inspectors, Track Marshals and the Race Director have the right to subject any vehicle to mechanical or visual inspection (including photographing) or impound at any time. It is the Team's responsibility to tear down a vehicle for inspection if required to do so. Failure to abide by this rule will lead to disqualification.

RACE DAY RULES

DURING THE RACE

All teams are allowed to have 5 students in total and 1 team leader per team, the roles of the students, and race personnel is described below.

TEACHER / TEAM LEADER

Only students are allowed to work on the car. Students may consult with their teacher(s) during the race, but teachers are not allowed in the pit area or to work on the car.

SERVICE MAN / MECHANIC

Servicing and maintenance of vehicles are permitted in the team's pit stop only; any repair or amendment to the vehicle on the track is strictly prohibited.

TEAM SPOTTER

Each team will have dedicated spotter along side a track, only the spotter is allowed to walk on the track when the car needs assistance during the race (e.g. after collision). If the Race Director provides Track Marshals, the Team Spotter is not allowed on the track.

DRIVER

The driver is not allowed to interfere with their team's vehicle by any means while they are driving; only team members /mechanics are permitted to interfere with the vehicle. Every team is advised to have at least 2 drivers who can alternate during the race.

TECHNICAL ASSISTANT

Technical assistants will be available for teams. The technical assistant will not be allowed to work on the car (unless that person deems it necessary).

TRACK MARSHAL

Marshals are authorized to give a warning to the driver/team before an official penalty from the Race Director. Track Marshalls may be provided by the Race Director and are responsible for assisting crashed cars.

RACE DAY RULES

DURING THE RACE

Radio communication is allowed between driver, mechanics and team leader.

- Radio communication can only be used by the driver and their pit crew, only while their driver is in the drivers area for the duration of the race.
- A single ear piece or one sided head set type that is not audible to others and does not reduce the ability to hear the Race Director's calls must be used.
- Any 2.4 GHz radio equipment is not allowed, .

RACE DAY RULES

EVENT ZONE RULES

All H2GP PRO events will be physically divided into different zones based on their use. The actual layout of the event can differ every time, but the rules for individual zones will remain unchanged.

The general rules in each of them are summarized below:

RACE ZONE

Only track marshals are allowed to enter the track. Vehicles are obliged to exit/enter the track in dedicated area (pit-lane).

Any modification or addition of own devices to the racetrack is prohibited and will be penalized accordingly.

DRIVER'S ZONE

If the venue allows, there will be a designated drivers zone that all drivers are obliged to use. If no driver zone exists, drivers must be in their team zone.

Only one driver is allowed in the driver's zone at a time. Drivers can change during the race anytime they need/want.

TEAM ZONE

Zone dedicated to the student teams only, each team will have a designated pit area, in which students are obliged to fix their vehicles here. Students need to stay in the area dedicated to their team. No electricity is allowed in the team zone.

Each team must work independently in their dedicated team area - pit stop. Multiple teams cannot share, combine or merge their pit-stops together.

TECH ZONE

Students are obliged to pass the tech inspection here, change their batteries and Hydrostiks here. Electricity and shared power tools are allowed in tech zone.

RACE DAY RULES

FLAGS

GREEN FLAG / NATIONAL FLAG

- The green or national flag indicates the beginning of the race

CHECKERED

- Displayed at the start/finish line to indicate that the race is officially finished.

YELLOW FLAG

- Danger on the track, all drivers must slow down their vehicles.

BLACK FLAG – INDIVIDUALLY ADDRESSED

- When a driver is given the Black Flag, it means that the driver must pull their vehicle off the track immediately into the pit-lane.
- A black flag will be given to a driver whose driving, vehicle operation, or performance constitutes a hazard to the other vehicles in the race. This includes insufficient skills to compete in the race, unsportsmanlike driving, and intentional hitting of other vehicles, intentional short coursing, intentional corner cutting, intentional blocking when being overtaken, illegal or improper vehicle numbers and other such acts.
- A black flag ruling may be used at any time for unsportsmanlike conduct or abusive language to other drivers or race officials.
- Any vehicle that loses its body or that cannot be controlled properly due to radio problems, race damage, or missing parts will be black-flagged.
- Failure to comply with any of these rules, not limited to items covered in this section, may result in penalty or disqualification by the Race Director

RACE DAY RULES

PENALTIES

- Race Director may assess “stop and go” penalties, with or without delay to act of rules violation. During a “stop and go” penalty, the vehicle must enter the pit lane and stop at designated area until the Race Director permits the car to continue in the race.
- Failure to comply with any H2GP PRO rules, not limited to those items covered in this section, may result in a penalty being assessed by the Race Director.
- The Race Director will distinguish two different groups of penalties; driver penalty - given to a driver violating the rules, and team penalty given in case that any other member or whole team violated the rules.
- The Race Director will distinguish three different grades of penalties according to the seriousness of the rules violation.
- The Race Director at their own discretion may provide a warning prior to missing the first penalty.
- The number of penalties allowed is up to the discretion of the Race Director. Repeated violations may lead to a higher graded penalty:

PENALTY	DRIVER	TEAM
1 st GRADE	30 seconds	3 minutes
2 nd GRADE	60 seconds	15 minutes
3 rd GRADE	Driver DQ*	Team DQ

**repeated penalization of the driver will lead to driver DQ, which automatically means one team penalty*

RACE DAY RULES

EXAMPLES OF DRIVER PENALTIES

- Corner cutting is any deliberate or accidental maneuver that shortens the length of the course for a vehicle traveling around the track.
- Improper re-entry is any maneuver that adversely affects the ability of other drivers in the race to safely operate their vehicles.
- Vicinity of the vehicle re-entering the racing surface, whether from the pit lane or any other point.
- Repairing or servicing a vehicle in the pit lane.
- Driving in the opposite direction to the racing direction during the race.
- Disturbing and any other interfering behavior to other drivers in driver's area.

EXAMPLES OF TEAM PENALTIES

- Any technical violation during a technical inspection during the race.
- Any unmarked batteries or Hydrostiks in the pit stop area.
- Presence of a teacher or any other adult in the pit stop area, unless there is technical assistance allowed by the Race Director.
- Disobeying the Race Director's instructions.
- Deliberately modifying, changing, blocking, or otherwise interfering with the racetrack.
- Ignoring the black flag.

RACE DAY RULES

DISQUALIFICATION

Any of the following actions on the part of a driver or member of their team will result in mandatory disqualification from the event.

- Collecting 3 team penalties
- Subjecting a Race Officials to improper language or other demeaning actions,
- Subjecting other contestants to improper language, other demeaning actions, or unsportsmanlike behavior
- Deliberate bumping, or blocking
- Not submitting the vehicle for technical inspection prior to, during and after the race.
- Failure to abide by charging specifications with LiPo batteries (i.e.:overcharging).

This document has been developed as a part of H2GP SERIES.

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