

Global Green Challenge Eco Rally
CAMS Permit No 809/3110/01
Supplementary Regulations
For all vehicles other than Solar-Class

1. EVENT TITLE, DATE AND VENUE.

The event shall be known as the Global Green Challenge (herein after referred to as The Event) and will be held between Darwin and Adelaide on the Stuart Highway (main road) between both cities and designated venues between both cities as published. The Event will be held between October 23-31th 2009.

2. ORGANISATION & STATUS.

- (a) This event will be held under the authority of the International Sporting Code of the Federation Internationale de l'automobile (FIA), the National Competition Rules (NCR) of the Confederation of Australian Motor Sport Ltd (CAMS). The 2009 Technical Regulations for Alternative Energy Vehicles, these Supplementary Regulations and any Further Supplementary Regulations, Bulletins and instructions to competitors that may be issued.
- (b) The purpose of the event will be to recognise the actual fuel/ energy used by the entrant under road rules and regulations.
- (c) The event will be a National event
- (d) The event will be conducted under and in accordance with CAMS OH&S and Risk Management Policies, which can be found on the CAMS website at www.cams.com.au

3. ADMINISTRATION AND EVENT STAFF

- (a) The Organiser and Promoter of the Event is the South Australian Motor Sport Board, a body established pursuant to the South Australian Motor Sport Act of 1984(the act).
- (b) **Organising Committee:** D Raggatt, C Selwood, J Franklin, J Mattner, M Drewer, A Williss
- (c) **Postal Address** PO Box 663 Kent Town,
South Australia 5071

4. OFFICIALS OF THE MEETING

To be advised in Further Regulations

5. JUDGES OF FACT

To be advised in Further Regulations

6. ROUTE DETAILS

The distance to be travelled approx 3000kms as defined by the Organiser in the Road book to be published in the Further Supplementary Regulations. The maximum distance required to be travelled in any one day, will be approx 750kms.

7. ENTRIES

- A) Maximum number of entries will be 50, and selection will be in accordance with relevant Classes and Technical Regulations.
- B) Minimum licence requirements for each driver will be CAMS level 2S Competition licence as supplied by the organisers.
- C) A civil driver's licence for the class of vehicle entered or an equivalent international licence as recognised by Australian Authorities.

Opening Date: May 29, 2009
Closing Date: June 30, 2009

Entry Fee is by arrangement with The Promoter. Entries may be refused in accordance with NCR 83 of the current CAMS Manual. Event Organisers reserve the right to cancel, abandon or postpone the event in accordance with NCR 59 of the current CAMS Manual.

Entry Lodgement;

Submit entry form to the Event Director complete with all details, signature and entry fees.

Please Forward to;

The Event Administration

Global Green Challenge

PO Box 663 Kent Town, South Australia 5071.

8. INSURANCE

Insurance for this event will be in accordance with Appendix 1 of the current CAMS Manual.

9. PROTESTS

Protests must be lodged in accordance with Part XII of the current CAMS Manual.

10. ANTI DOPING POLICY

During any event, consumption of alcoholic beverages in the paddock, pits or any other portion of the competition venue under the control of the officials is expressly forbidden until all practice or competition activity is concluded for each day. Any driver or crewmember that is found to be affected by alcohol on the day of the event or practice therefore shall not be permitted to participate. Refer NCR 145A of the Current CAMS Manual. In addition, the persons concerned will be subject to the Articles of the Standard Operating Procedure for Alcohol Testing and CAMS Anti Doping Policy. Competitors, Crews or Officials, may be randomly tested for alcohol by a CAMS Accredited Testing Official (CATO), or other drugs at any time during the event(s). The CAMS Anti Doping Policy as appears in the CAMS Manual of Motor Sport and as amended from time to time, is recognised as an integral component of the NCR and is duly authorised as such. In any areas where the National Competition Rules and the CAMS Anti Doping Policy conflict, the CAMS Anti Doping Policy will take precedence.

11. AWARDS

Awards will be based on Vehicle economy and not speed related. Details to be in Further Regulations.
All results will be issued as a public document

12. SCRUTINY

Scrutiny will be at Darwin on October 23th 2009 at a time and place to be notified in Further Regulations.

Details of documents to be presented at the document verification including: current and valid CAMS Competition licence, current CAMS affiliated car club membership card and CAMS Vehicle Logbook.

Each entrant vehicle will be required to carry a minimum 2kg fire extinguisher, 2 safety triangles, OK/ SOS board as per CAMS regulations, a basic first aid kit, and UHF 2 way Radio.

13. PENALTIES

Penalties to be advised in Further Regulations

Global Green Challenge Eco Rally
Supplementary Regulations (continued)

Eligibility

Any production or prototype vehicle that meets the following criteria

Categories

Category A:

Production vehicles in normal delivered specifications that comply with all ADR regulations as applicable in all states and territories of Australia and can be road registered using normal commercially available fuel(s)

Category A1:

Production Hybrid vehicles that comply with FIA Article 9 attached to these regulations.

Category A2:

Production battery electric vehicles that comply with FIA Article 9 attached to these regulations.

Category A3:

Production alternative fuel vehicles eg: LP Gas, LN Gas etc.

Category B:

Modified / non standard production vehicles

Category C:

Prototype-experimental vehicles.

Note: Vehicles in Cat B or C must be able to satisfy State road laws and able to be issued with conditional registration for the duration of the event

The organising committee are the final arbitrators on the classification of any entry.

Event Regulations (continued)

All vehicles must be presented for scrutiny at a time and place to be advised in normal production (Catalogue) specifications.

1.1 Each vehicle entered must have at least 2 drivers in the car at all times

1.2 Vehicles must comply with any local traffic speed restrictions and must not exceed the speed limits as prescribed by the various States and Territories

1.3 All vehicles must only travel between the times as designated in Further Supplementary Regulations as published

1.4 All vehicles will be impounded in a designated “ parc ferme “ each night during the event, no work may be carried out on the vehicles in this area.

1.5 Seals will be attached to all Fuel openings or any other area as desired by the scrutineers.

1.6 Fuelling / refuelling can only be carried out at designated outlets as agreed with the promoter, resealing of fuel outlets will be by an authorised event person. Fuel must comply with Schedule G of the current CAMS Manual

1.7 Vehicles may be subjected to random scrutiny checks at any time on the road as deemed by the promoter.

1.8 Only commercially available fuel will be used and the promoter will ensure that this is available at suitable intervals for all competitors. In the case of any vehicle in Categories that use non-commercial fuels they may only refuel at designated points agreed with the promoter and under supervision ensuring all safety regulations are adhered to.

Electric Vehicles

1.9 Electric vehicles may be recharged at any time and all-energy inputs, must be recorded by a suitable measuring device. Electric vehicles may recharge overnight in the “ parc ferme” using normal safety standards and monitoring devices

TECHNICAL REGULATIONS

As per article 9 FIA Alternative Energy Technical Regulations

ELECTRIC VEHICLES (CATEGORY VII)

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- FIA Règlement Technique Energie Alternative / Alternative Energy Technical Regulation*
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PREFACE

The following Technical Regulations for Hybrid Electric Vehicles are issued by the FIA. As only electric hybrid systems are described in the current rules, the term "Electric Hybrid System" will be contracted to "Hybrid System" hereinafter. These regulations come into force on 1 January 2010.

The new hybrid rules establish and promote a new era of motor sport with environmentally friendly vehicles. Such vehicles offer excellent performance with reduced fuel consumption and reduced CO₂ emissions compared to non-hybrid vehicles with a similar weight-to-power ratio.

The goals of the new rules can be summarised by one single phrase: utilisation of vehicles with excellent performance, reduced fuel consumption and reduced CO₂ emissions.

ARTICLE 1 DEFINITIONS

1.1 Hybrid Vehicle (Category VII)

The International Electrotechnical Commission (IEC) defines a

hybrid vehicle as: "one in which propulsion energy, during specified operational missions, is available from two or more kinds or types of energy stores, sources, or converters."

1.1.1 Series Hybrid Vehicle

A series hybrid is a HV in which only one energy converter can provide propulsion power.

1.1.2 Parallel Hybrid Vehicle

A parallel hybrid is a HV in which more than one energy converter can provide propulsion power.

1.1.3 Power Split Hybrid

A power split hybrid is an HV equipped with a mechanical power split device that splits the power supplied by the i.c. engine between two output shafts, one connected to an electric generator, the other connected to the traction wheels through a transmission.

Typically, the power split device is a planetary gear set, similar to the systems used in automatic transmission.

Furthermore, also joined to the shaft connected to the traction wheels is an electric motor, in a parallel configuration.

The system is also called series-parallel hybrid or two-mode hybrid.

1.1.4 Full Hybrid Vehicle (Group 1)

A hybrid vehicle, in which the electric motor is able not only to assist the i.c. engine but also to propel the vehicle without the help of the i.c. engine, is the so-called zero emission mode.

The range of the zero emission mode in a full hybrid could be several kilometres (Plug-in Hybrid, PHEV) or fewer (like Prius).

FIA Règlement Technique Energie Alternative / Alternative Energy Technical Regulations

FIA Sport / Département Plug-In Hybrid Vehicle (Group 2)

A plug-in hybrid vehicle is a hybrid vehicle that has a large high-capacity battery pack that can be recharged by being plugged into normal household power outlets as well as using the onboard charging capabilities of regular hybrids. While regular electric hybrids require a combination of regenerative braking and energy from the engine to recharge the STSY and propel the vehicle, plug-ins can operate either as electric vehicles with an internal combustion engine backup generator (Extended Range Electric Vehicle, E-REV) or as a regular full hybrid vehicle with a high-capacity battery pack.

1.2 FIA-AEC Vehicle Technical Passport

Official document for the vehicle including specific indications, issued by the FIA, hereafter named as "Technical Passport".

All vehicles participating in events must have a Technical Passport. This Technical Passport contains an exact description of the vehicle along with all data necessary for the identification of the vehicle.

Exception: Driving Tests Events.

The Technical Passport must contain one electrical drawing (A4, 21 x 29.7 cm) of all the essential power circuits of the electrical equipment of the vehicle. This circuit drawing must show the generator(s), batteries, fuses, circuit breakers, power switchers, capacitors, motor-controller or chopper, traction motor(s), and junction cables. All components in the circuit drawing must be labelled with their detailed electrical specifications.

A second drawing of the vehicle in plan view (from above) must show the location of these components within the vehicle. Both of the said electrical drawings are an integral part of the Technical Passport.

The Technical Passport must contain a contingency plan (rescue plan, disaster plan) for incidents involving the vehicle's STSY, such as battery or capacitor overheating or fire. The plan must

dwell on the specific cell chemistry of the traction battery.

The Technical Passport must be presented at scrutineering. The Stewards have the right to refuse to allow a competitor to take part in the event if the said competitor fails to submit the Technical Passport. It shall be the responsibility of the competitor to obtain the Technical Passport for the vehicle, along with any amendments or addenda to the said form, from the ASN. The responsibility for the data declared on the Technical Passport and for the drawings contained therein lies with the competitor.

1.3 Weight-to-Power Classes

Vehicles are classified, with the exception of Driving Test Events, in 7 weight-to-power classes (WP-Classes) according to the weight-to-power ratio (WPR) of the respective vehicle. The Hybrid Classification Table (HCT) provides the classification method and data to establish the vehicle classification.

1.3.1 Nominal Hybrid Vehicle Power

The nominal power P_N of a hybrid vehicle is the sum of the internal combustion engine power P_{ICE} and the weighted electric motor power P_E . Additionally, the STSY power P_{STSY} is taken into account for plug-in hybrid vehicles. P_{STSY} is the maximum stored energy discharged during a specific duration.

1.3.2 Hybrid Classification Table

The Hybrid Classification Table (HCT) provides the method and gives the data to assign hybrid vehicles to 7 weight-to-power classes. All vehicle data used to determine the weight-to-power class must be taken from the Technical Passport.

1.4 Land vehicle

A land vehicle is a locomotive device, propelled by its own means, moving by constantly taking real support on the earth's surface, and of which the propulsion and steering are under the control of a driver aboard the vehicle.

1.5 Hybrid Vehicles for non-speed events

The specific vehicle type and model must have valid vehicle for public road use. It is sufficient for these vehicles to carry standard safety equipment required by the traffic laws of the respective country.

1.5.1 Large scale Series Production Vehicles

At least 2500 identical units must have been produced in 12 consecutive months.

1.5.2 Low volume Series Production Vehicles

The specific vehicle type and model must have been manufactured in a quantity of at least 10 identical vehicles in 12 consecutive months.

1.5.3 Vehicles

1.5.3.1 Converted Vehicles

Converted vehicles are vehicles which have been transformed from a production line vehicle equipped with an internal combustion engine into a hybrid vehicle. No parts of the body shell or of the frame of the structure may be changed.

1.5.3.2 Modified Vehicles

Modified vehicles are vehicles derived from a series produced hybrid vehicle. If the Maximum Gross Vehicle Weight (GVW) of the modified vehicle is higher than on the manufacturer's identification plate or if parts of the body shell or of the frame of the structure are changed, valid vehicle registration documents for public road use or a certificate signed by a suitably qualified professional engineer must be presented to the event scrutineers. This certificate must be accompanied by dimensioned drawings and photos of the complete mechanical structure in question, declaring that this mechanical structure can resist the forces involved in the event.

1.5.3.3 Prototype Vehicles

Prototype vehicles are either fully newly built vehicles or vehicles not covered by the provisions mentioned above. They need either valid vehicle registration documents for public road use or a certificate signed by a suitably qualified professional engineer. This certificate must be accompanied by dimensioned drawings and photos of the complete mechanical structure in question, declaring that this mechanical structure can resist the forces involved in the event.

1.6 Hybrid Vehicles for speed events

1.6.1 Series Production Vehicles

Vehicles according to one of the Groups listed in Art. 251- Category I of Appendix J of which the production of a certain number of identical units within a certain period of time has been verified at the request of the manufacturer, and which are destined for normal sale to the public. Vehicles must be sold in accordance with the type approval registration documents for public road use.

1.6.2 Competition cars

Vehicles according to Art. 251-Category II of Appendix J, built as series production vehicles in small quantities or singly or as prototypes, and destined solely for competition.

1.7 Genuine spare parts

Genuine spare parts are standard parts offered for the respective vehicle model, included in the official spare part lists with part numbers and offered through the manufacturer's common distribution channels.

1.8 Internal Combustion Engine

The internal combustion (i.c.) engine is the on-board energy converter for fuel energy and originates from the series production for the specific vehicle model.

1.9 Weight

1.9.1 Minimum weight

The vehicle's minimum weight is the actual weight of the empty vehicle without driver and luggage aboard, with all compulsory safety devices, the standard tool kit and a maximum of one spare wheel.

1.9.2 Ready-to-start weight

The actual weight of the vehicle at the starting grid with occupants, luggage and safety equipment.

1.9.3 Maximum Gross Vehicle Weight

Maximum Gross Vehicle Weight (GVW) is defined as the Maximum design Total Mass (MTM) (M07 according to ISO 1176) i.e. the maximum vehicle mass as defined by the vehicle

Storage System (STSY)

A Rechargeable Energy Storage System (STSY), such as a flywheel system, super-capacitors, ultra-capacitor, batteries, etc., is a system that is designed to recover kinetic energy from the car during deceleration or braking, store that energy and make it available to propel the car. Additionally, the STSY may be recharged from the fuel-based energy converter or, for plug-in hybrids, directly from the grid.

1.10.1 Flywheel system

A flywheel system is a mechanical or electromechanical system capable of storing and releasing energy by means of a rotating mass system, such as the rotor of an electric motor/generator.

1.10.2 Capacitors

A capacitor (electrolytic capacitor, Electric Double Layer Capacitor (EDLC) named "Super Capacitor" or "Ultra Capacitor") is a device to store electric energy in the electric field or, in the case of the EDLC, a system in which an electric charge is stored, permitting adsorption and desorption of the ions in an electrolyte to electrodes.

1.10.3 Traction battery

The traction battery is a STSY and supplies electric energy to the power circuit and thus to the traction

motor(s). The traction battery is defined as any equipment used for the intermediate storage of electrical energy supplied by the conversion of kinetic energy or by a generator or by the charging unit (for plug-in hybrids). Any on-board battery electrically connected to the power circuit is considered as an integral part of the vehicle's traction battery. The traction battery consists of numerous electrically connected battery cells grouped together in battery modules.

1.10.3.1 Battery pack

A battery pack is a single mechanical assembly optionally housed by a battery compartment, comprising battery modules, retaining frames or trays, fuses and contactors as well as battery supervising electronics.

1.10.3.2 Battery module

A battery module is a single unit containing one cell or a set of cells electrically connected and mechanically assembled.

1.10.3.3 Battery cell

A cell is an electrochemical energy storage device of which the nominal voltage is the electrochemical couple nominal voltage, made of positive and negative electrodes, and an electrolyte.

1.10.3.4 Energy capacity of the traction battery

The capacity C1 is the capacity of the battery in Ah at a battery temperature of 25°C and for a complete battery discharge within 1 hour. The on-board energy is calculated as the result of the product of the nominal voltage of the vehicle's traction battery in volts and the capacity C1 in Ah. The energy capacity must be expressed in kWh.

1.10.3.5 Battery supervising electronics

The battery supervising electronics is part of the battery pack and an important safety system. It comprises a monitoring and charge-balancing circuit to keep all cells, at any time and under any charge or discharge conditions, within the specified voltage range given by the battery manufacturer.

1.11 Power circuit

The power circuit (power electronics, power converter) consists of all those parts of the electrical equipment which are used for driving the vehicle (see APPENDIX 4C of the current FIA-AEC Technical Regulations).

1.12 Power bus

The power bus (see APPENDIX 4C of the current FIA-AEC Technical Regulations) is the electric circuit used for energy distribution between the generator, the STSY (e.g. traction battery) and the propulsion system which consists of the power electronics and the drive motor(s).

1.13 Overcurrent trip (fuses)

An overcurrent trip is a device which automatically interrupts the electrical current in the circuit in which it is installed if the level of this current exceeds a defined limit value for a specific period of time (see APPENDIX 4A of the current FIA-AEC Technical Regulations).

1.14 General Circuit Breaker ("Emergency stop switch")

The General Circuit Breaker is a contactor, i.e. a switch with physical contacts and NOT a semiconductor device.

- to cut off all electrical energy transmission of the power circuit (STSY to the loads such as the power electronics and the electric motor),
- to cut off all electrical transmission of the auxiliary circuit (auxiliary battery and possibly the alternator to the loads such as lights, hooters, ignition, electrical controls, etc.) and

- to stop the engine. For Diesel engines having no electronically controlled injectors, the General Circuit Breaker must be coupled with a device cutting off the air intake into the engine.

The General Circuit Breaker is activated by at least one trigger switch from inside or outside the vehicle. The General Circuit Breaker must not be used as the Driver Master Switch.

1.15 Conditions for measurement of the maximum voltage

The maximum voltage must be measured at least 15 minutes after the end of charging of the STSY.

1.16 Power Circuit Ground

Power Circuit Ground is the ground potential of the electrical Power Circuit.

1.17 Chassis Ground, Vehicle Ground and Earth Potential

Chassis (Vehicle and Bodywork) Ground, hereinafter named "Chassis Ground", is the electrical reference potential (earth potential) of all conductive parts of the bodywork including the chassis and the safety structure. Auxiliary ground must be connected to chassis ground. The conductive cases of the STSY and of Power Circuit units such as motor(s) and contactors should have robust connections to Chassis Ground.

1.18 Auxiliary battery

The auxiliary battery supplies energy to the electrical equipment used for the i.c. engine, for signalling, lighting or communication.

1.19 Auxiliary Circuit

The Auxiliary Circuit (network) consists of all those parts of the electrical equipment used to operate the i.c. engine, for signalling, lighting or communication (see APPENDIX 4C of the current FIA-AEC Technical Regulations).

1.20 Auxiliary Ground

Auxiliary Ground is the ground potential of the Auxiliary Circuit. Auxiliary Ground should have a robust connection to Chassis Ground.

1.21 Driver Master Switch

The Driver Master Switch (DMS) is a device to energise or deenergise the Power Circuit under normal operating conditions

- with the exception of all electrical equipment needed to run the i.c. engine and
- with the exception of the systems needed
 - to monitor the isolation resistance between Chassis Ground and Power Circuit and
 - to monitor the maximum DC as well as AC voltage between Chassis Ground and Auxiliary Circuit supply voltage.

1.22 Safe / Live Signage

The Safe / Live Signage is a safety device to clearly show the "Live" or "Safe" condition of the Power Circuit. "Live" means that the Power Circuit is energised and "Safe" means that the Power Circuit is off.

1.23 Detonator

A detonator is a pyrotechnical device fired by an electric current and used to cut electric power wires.

ARTICLE 2 CLASSIFICATION

All vehicles must be in accordance with either

- One of the Groups listed in Art. 251 of Appendix J, Category I or Category II
- For non-speed events: Series Production Vehicles (Art. 1.5.1 and 1.5.2) or Prototype Vehicles (Art. 1.5.3) complying with Article 7 of the current regulations.

a) Only vehicles according to Articles 1.1.1 (Full Hybrids) and

1.1.2 (Plug-In Hybrids) and complying with the following Article 2.1 or 2.2 of the current regulations are classified.

b) Furthermore, the Articles of the current regulations on Definitions (Art. 1), General Prescriptions (Art. 3) and Safety Equipment (Art. 5) are compulsory for all vehicles.

c) Low volume Series Production Vehicles and Prototype Vehicles must additionally comply with the provisions of the current regulations on Electrical Equipment and Electrical Safety according to Articles 4 and 6.

Moreover, depending on the type of event, the following regulations apply.

2.1 Hybrid vehicles for non-speed events

These vehicles must have:

- For Rallies: official and valid vehicle registration documents and valid licence plates for public road use.
- For other events: a valid Technical Passport for Category VII or valid vehicle registration documents for public road use.
- The year of manufacture must be after 1 January 2004. It is up to the competitor to prove the date of manufacture.
- The Safety Equipment specified in Art. 253 of Appendix J is recommended.

2.2 Hybrid vehicles for speed events

These vehicles must have:

- FIA-AEC Technical Passport for Category VII.
- For rallies: on public roads, valid vehicle registration documents and licence plates.
- The year of manufacture must be after 1 January 2004. It is up to the competitor to prove the date of manufacture.
- The safety equipment specified in Art. 253 of Appendix J is mandatory.

ARTICLE 3 GENERAL PRESCRIPTIONS

3.1 Conformity with the regulations

All modifications are forbidden unless expressly authorised by the regulations specific to the group in which the car is entered or by the general prescriptions below or imposed under the chapter "Safety Equipment" (Articles 5 and 6 of the current regulations). Permitted changes must not cause forbidden changes or breaches of the regulations. It is the duty of each competitor to prove to the event scrutineers that his vehicle fully complies with the regulations governing the event in their entirety, at all times during the event.

The components of the car must retain their original function.

Parts, but not fluids, that have been damaged through wear and tear or accident may, if not otherwise specified in the following text, be replaced only with identical spare parts.

3.2 Emission requirements

All vehicles of Category I and Group GT Category II, Art. 251 of Appendix J, must comply with the emission standards for the year of manufacture that are specified either in the US or the European emission standard.

N.B.: The application of this article is left to the discretion of each ASN.

FIA Règlement Technique Energie Alternative / Alternative Energy Technical Regulations For rallies: on public roads, valid vehicle registration documents and licence plates.

- The year of manufacture must be after 1 January 2004. It is up to the competitor to prove the date of manufacture.
- The safety equipment specified in Art. 253 of Appendix J is mandatory.

ARTICLE 3 GENERAL PRESCRIPTIONS

3.1 Conformity with the regulations

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FIA Règlement Technique Energie Alternative / Alternative Energy Technical Regulations 3.3 Related regulations

FIA-AEC Technical Regulations for Alternative Energies Vehicles, Appendices 4 and 5.

3.4 Accessories and optional equipment

All accessories and optional equipment that can be delivered from the manufacturer at extra charge when purchasing the vehicle are considered as standard equipment in the sense of the current Category VII Regulations. Spare parts that have been installed on the vehicle after delivery are considered as standard equipment if they are or were deliverable from the vehicle manufacturer for the vehicle model concerned.

It is up to the competitor to prove by whatever means that the vehicle and the vehicle components are in the same standard condition as when delivered from the manufacturer.

3.5 Weight and ballast

3.5.1 Minimum vehicle weight

The minimum weight of the vehicle must be in compliance with the manufacturer's indications and must correspond to the minimum weight listed on the Technical Passport or, for Driving Tests Events, must correspond to the minimum weight listed in the valid vehicle registration documents for public road use.

When two spare wheels are carried in the car, the second spare wheel must be removed before weighing.

All the liquid tanks (lubrication, cooling, braking, heating where applicable) must be at the normal level foreseen by the manufacturer, with the exception of the windscreen wiper or headlight wiper, brake cooling system, fuel and water injection tanks, which shall be empty.

The FIA-AEC reserves the right to have the weight checked and confirmed by a technical expert.

The minimum weight will be used to classify the hybrid vehicles according to Article 3.6 "Weight-to-Power Class".

3.5.2 Ready-to-Start weight

The Ready-to-Start weight is used for the consumption classification.

The Ready-to-Start weight must not exceed the defined Maximum Gross Vehicle Weight defined in Article 1.9.3.

3.5.3 Ballast

It is permitted to complete the weight of the car by one or several units of ballast, provided that they are

strong and unitary blocks, fixed by means of tools with the possibility of affixing seals, and placed on the floor of the cockpit, visible and sealed by the scrutineers.

3.6 Weight-to-Power Classes

The assignment of the correct "Weight-to-Power Class" (WPC) to a hybrid vehicle is carried out in three steps:

- In the first step, the "Nominal Vehicle Power" PN is calculated with the formula given in Article 3.6.1;
- In the second step, a value for the "Weight-to-Power Ratio"

(WPR) is calculated with the formula given in Article 3.6.2, and;

- In the third step, the WPR number is used to determine the correct WPC. The correspondence between a WPR number and the WPC is given in the Hybrid Classification Table presented in Article 3.6.2. Neither the power of the internal combustion engine, nor that of the electric motor, nor the capacity of the STSY registered in the Technical Passport may be changed.

The WPC of a vehicle is kept only if the minimum weight according to Art. 1.9.1 is not exceeded.

It is both the duty and the responsibility of the competitor to specify the vehicle's correct WPC to the organizer.

The FIA-AEC reserves the right to adjust the classification of a hybrid vehicle according to the Hybrid Classification Table HCT.

3.6.1 Nominal Vehicle power

The Nominal Vehicle Power PN is given for hybrid vehicles by:

$$P_{N} = P_{ICE} + P_{E} + k_{E} P_{E}$$

+

= + \oplus and for

plug-in hybrid vehicles by:

$$P_{N} = P_{ICE} + P_{E} + k_{E} P_{E} + P_{STSY}$$

FIA Règlement Technique Energie Alternative / Alternative Energy Technical Regulations P_{ICE} as the maximum "Power of the i.c. engine" in kilowatt [kW] according to the Technical Passport,

P_E as "Power of the electric engine," is either the maximum power of the electric traction motor or, if more than one electric traction motor is used, the sum of the maximum power of all electric traction motors in kilowatt [kW] according to the Technical Passport, and P_{STSY} as the maximum "Power of the STSY" in kilowatt [kW] given by P_{STSY} = E_{STSY} / T_D with E_{STSY} as the maximum usable "Energy in the STSY" in kilowatt hours [kW] according to the Technical Passport, and T_D as the "Discharge time" of the maximum usable energy in the STSY in hours [h].

The factor k_E is used to account for the type of hybrid vehicle and is given by:

k_E = 0 for series hybrid vehicles.

Explanation: The i.c. engine powers a generator and the generator powers the electric traction motor(s).

k_E = 2 for parallel hybrid vehicles.

Explanation: The i.c. engine and the electric traction motor(s) jointly propel the vehicle.

0 < k_E < 2 for power split hybrid vehicles.

Explanation: The i.c. engine powers the traction wheels, as well as a generator and the electric propulsion motor(s) receive the electric energy from the generator and from the STSY.

k_E = 1 for plug-in hybrid vehicles.

T_D = 0.5 hours

The FIA-AEC and the organiser of FIA-AEC hybrid vehicle speed events are authorised to determine, in the Supplementary Technical Regulations, specific values for the factor k_E and the discharge time T_D .

3.6.2 Hybrid Classification Table

The Weight-to-Power Ratio WPR is a value given by:
 $WPR = \text{Minimum weight in kg according to the FIA AEC Technical Passport} / (\text{Nominal hybrid vehicle power } P_N \text{ in kW})$

Hybrid Classification Table HCT

Weight-to-Power Class

(WPC) Weight-to-Power Ratio (WPR)

1 less than

2,5

2 from

2,5

to

< 3,4

3 from

3,4

to

< 4,6

4 from

4,6

to

< 6,1

5 from

6,1

to

< 8,2

6 from

8,2

to

< 11

7 from

11

to

< 14,7

8 from

14,7

to

< 19,7

9 from

19,7

to

26,5

10 over

26,5

Example:

Parallel hybrid ($k_E = 2$), 1550 kg, 55 kW i.c. engine power, 15 kW electric motor:

$ICE E$

E

$NICE EE P P$

$P P k P P$

+

$= + \oplus = 55 +$

$2 \times 15 / (55 + 15) = 55 + 6.43 = 61.43$

$FIAWPR = 1550 / 61.43 = 25.23 \Rightarrow$ from the HCT we get a **Weightto-Power Class 9** for this vehicle.

N.B.: the text of Article 3.6 may be updated in order to take into account new experimental data, which ensure the fairness of competition.

3.7 Fuel

The regulations according to Article 252-9 of Appendix J must be maintained.

N.B.: The application of this article is left to the discretion of each ASN.

ARTICLE 4 ELECTRICAL EQUIPMENT

4.1 STSY design and installation

Vehicles NOT having valid vehicle registration documents for public road use must comply with the provisions established in this article:

The STSY must be checked and sealed at scrutineering.

The Supplementary Regulations of the event must specify the weight and/or energy content of the STSY.

The Supplementary Regulations of the event may permit part of the STSY or the complete STSY to be changed during the event (e.g. a cell or a battery module of a traction battery) under the control of a race official and by decision of the stewards. The STSY should be housed within the survival cell of the vehicle.

The vehicle manufacturer must prove, by whatever means, that the STSY installed in the vehicle has been designed in such a way that, even when subjected to a crash

- The mechanical as well as electrical safety of the STSY is secured and

- Neither the STSY nor the fastening device itself nor its anchorage points can come loose.

It is strongly recommended that the STSY and its mounting system should be crash-tested to an FIA-approved test specification.

The STSY compartment must be designed in such a manner as to prevent short circuits of the STSY poles and of the conductive parts, and any possibility of STSY fluid penetrating into the cockpit must be excluded. This compartment must completely surround the STSY and it must be made from an insulating, fireresistant, robust and STSY fluid-tight material. A solid partitioning bulkhead must separate the location of the STSY from the cockpit.

Each STSY compartment located inside the vehicle must include an air intake with its exit outside of the vehicle. The dimensions of the air duct and the power of the ventilation fan must be sufficient to prevent an ignitable gas/air concentration inside the STSY.

Although crash robustness is mandatory according to equivalent specifications as for the vehicles's roll structures, it is recommended to use a few battery modules (see Art. 1.10.3.2) electrically connected in series, in order to obtain the traction battery (see Art. 1.10.3) with a terminal voltage in excess of 60 V.

The connection of the battery modules with a terminal voltage of less than 60 V should be made in such a way that if subjected to a crash, the electrical connection can break easily between the enclosed battery modules (internal storage stringing). Consequently, the maximum voltage between two cables of the power circuit (see Art. 1.11) will carry a voltage of less than 60 V and can thus be considered safe.

The STSY should be capable of being manually isolated from the Power Circuit either by provision of an easily removable main connector or alternatively by use of a separate insulated key or plug.

The STSY must include inside the compartment

- fuses at both polarities of the output terminals (connection of the power cable),

- an electrically-activated contactor (General Circuit Breaker) to

- disconnect the STSY from the Power Circuit, and
- detonators (see Art. 1.23) to disconnect the STSY in case of a severe crash with airbag deployment. The gas produced by the detonators should on no occasion increase the pressure inside the STSY beyond the burst pressure of the STSY housing. Consequently, the size of the ventilation duct of the STSY housing to the outside of the vehicle has to be sufficiently large.

All conductive parts of the STSY and of the wiring must have double isolation.
On each battery compartment the symbols warning of "High Voltage" must be displayed.

4.1.1 Specific provisions for Batteries and Capacitors

The batteries or capacitors housed in the battery compartment must be attached to the chassis using metal clamps with an insulating covering or insulating clamps, fixed to the floor by bolts and nuts with sufficient strength. The fixation of the batteries or capacitors within the STSY compartment depends on the type of batteries or capacitors and the mounting provisions specified by the producer. For a bottom mount battery, usually short bolts, clamps, screws, washers, and nuts are sufficient for proper attachment. For batteries or capacitors without specific mounting provisions, specific mounting parts like non-conductive straps and/or metallic bolts with an insulating cover and with nonconductive or insulated plates, washers and nuts may be used to install the batteries or capacitors in the compartment. The weight of the traction batteries is free and the following battery types are permitted:

- Lead-Acid
- Zinc-Bromium
- Nickel-Metal-Hydride
- Lithium-Ion.

Any request for additions to the list of permitted batteries must be addressed to the FIA 3 months in advance of the first event in which the equipment is to be used, giving full details of the chemistry. No modification to a battery cell (or module) itself is allowed.

For lead-acid batteries, only valve-regulated types (gel-types) are permitted.

Lithium batteries must be equipped with battery-supervising electronics. The special provisions are set out in Article 6.11.

A plug-in hybrid vehicle may recharge the traction battery only at the times given in the Supplementary Regulations of the event.

4.1.2 Specific provisions for Flywheel Systems

It is up to the competitor to prove by whatever means that the Flywheel System compartment is strong enough not to break up in case of a system failure, e.g. a rotor crash at full speed.

4.2 Auxiliary battery

The auxiliary battery should never be used to recharge the traction battery. Throughout the duration of the event, the battery supplying the auxiliary electrical circuit must have a voltage below 50 volts.

4.3 Power Bus

Voltage across capacitors belonging to the Power Bus should fall below 65 volts within 2 seconds after disconnection of all energy sources (generator, STSY and charging unit) from the Power Bus by the General Circuit Breaker or by the Driver Master Switch or by the activation of the overcurrent trips of the STSY.

4.4 Cables, lines and electric equipment

Brake lines, electrical cables and electrical equipment must be protected against any risk of damage (stones, corrosion, mechanical failure, etc.) when fitted outside the vehicle, and against any risk of fire and electrical shock when fitted inside the bodywork.

If the series production fitting is retained, no additional protection is necessary.

4.5 Charging units

The mains charging unit (charger) for plug-in hybrid vehicles (see Art 1.1.5) has to fulfil all safety provisions set out in the applicable rules in the country in which the respective event

takes place. mains plug must be a three pole plug (e.g. Schuko-plug (German-system) or EEC plug (IEC 309-2 standard)) connecting the vehicle's chassis ground (see Art. 1.17) to protective earth (PE) potential.

The charger must have a fuse to protect the AC charging cable, as well as a fuse to protect the DC charging cable. The vehicle charging fuse may reside in a "charging adapter" that may be removed when the vehicle is not being charged.

At least one end of the charging cable must NOT have a locking connector. The connector must part before the cable is damaged.

The DC charging cable connector(s) must be polarized and arranged so that incorrect polarity connection is impossible.

The charger main switch must disconnect ALL current-carrying supply conductors.

The vehicle traction system must be checked for ground faults before charging commences.

The vehicle traction system may not be energized while the battery is under charge.

ARTICLE 5 SAFETY EQUIPMENT

5.1 Dangerous constructions

Any vehicle whose construction could be dangerous may be excluded by the Stewards of the Meeting.

5.2 Optional devices

If a device is optional, it must be fitted in a way that complies with the regulations.

5.3 Fire extinguisher

Fire extinguishers in compliance with Article 253-7 of the ISC Appendix J are compulsory at speed events for vehicles according to Article 2.2 and recommended at non-speed events for vehicles according to Article 2.1.

Only ABC extinguisher types usable for fuel extinction, compatible with the chemistry of the installed STSY, and specified for the voltage level at the power bus are allowed.

5.4 Towing eye

All cars must be equipped with a rear and front towing eye for all events.

This towing eye will be only used if the car can move freely, and must not be used for lifting the vehicle.

The towing eye must be clearly recognisable and painted yellow, red or orange.

The additional towing eye provisions set out in Article 253-10 of the ISC Appendix J are compulsory for vehicles according to Article 2.2 and participating in speed events.

5.5 Unintentional movement of the vehicle

A device, e.g. the General Circuit Breaker, must prevent movement of the vehicle whenever the driver is not fully seated in the driver's seat.

The start key or button may serve as such a device for vehicles in non-speed events according to Article 2.1.

ARTICLE 6 ELECTRICAL SAFETY

6.1 General electrical safety

It must be ensured that a single point of failure of the hybrid system must not cause an electric shock hazardous to the life of any person and that the components used cannot cause injury under any circumstances and conditions (rain, etc), whether during normal operation or in foreseeable cases of malfunction.

It must be ensured that the components used for protecting persons or objects can reliably fulfil their purpose for an appropriate length of time.

There should be no exposed live metal or conductive parts in the system.

In cases where the voltage of the Power Circuit exceeds 50 volts, symbols warning of "High Voltage"

must be displayed on or near the protective covers of all electrical equipment that can run at high voltage; the symbols must comprise a black spark inside a *FIA Règlement Technique Energie Alternative / Alternative Energy Technical Regulations* yellow triangle with a black border. The sides of the triangle must measure at least 12 cm. All hybrid vehicles must comply with the regulations of the national authorities with regard to the standardisation and control of low voltage electrical installations. Likewise, the regulations of the IEC (International Electrotechnical Commission) (e.g. IEC 529, 718, 783, 784, 785, and 786), or of the national representative or member of the IEC (e.g. VDE/SEV), must be observed.

6.2 Protection against dust and water

All parts of the electrical equipment must be protected using at least IP 44 type protection (dust-proof and splash-proof).

However, it is recommended that IP 55 type protection be used (fully dust-proof and proof against streaming water) (see e.g. IEC 529 Article 4.2).

6.3 Protection against electrical shock

In no part of the electrical equipment may there be U_{max} voltage of more than 500 volts referred to earth and system ground respectively. The voltage is limited to 1000 volts between two points.

All major conductive parts of the body must be connected e.g. with wires of appropriate dimension to obtain equipotential bonding (see APPENDIX 4 B and APPENDIX 4 C of the current FIA-AEC Technical Regulations).

No part of the chassis or bodywork should be used as a current return path.

Between Power Circuit Ground and chassis (body) of the vehicle, no more than 50 volts are allowed.

An electronic monitoring system must permanently check the voltage level between Chassis Ground (= Auxiliary Power Ground) and the auxiliary power supply voltage. If the monitoring system detects a DC or AC voltage of less than 300 kHz with a voltage level of more than 50 V DC or 35 Veff AC respectively, the monitoring circuit must immediately (within less than 50 ms) switch off the STSY by means of the General Circuit Breaker.

6.4 Insulation resistance between chassis and power circuit

An electronic monitoring system must measure the insulation resistance R_{iso} between the conductive parts of the chassis (body) and the power circuit. The minimum insulation resistance R_{iso} must be more than 10,000 Ohm (50 V @ 5 mA). If the electronic monitoring system detects an insulation fault, all energy sources (STSY and generator, alternator) must immediately be disconnected from the power circuit by the General Circuit Breaker.

A simple device to protect people against electric shocks is given in APPENDIX 4 B of the current FIA-AEC Technical Regulations.

Due to the deformation of the car body in a crash, the power circuit will most likely be electrically connected to the chassis potential. In such a case, the electronic monitoring system will automatically switch off all energy sources by the General Circuit Breaker. Thus, the monitoring system additionally serves as a redundant trigger device to the crash impact detector.

6.5 Electrical cables

Each electrical cable must be suitable for a quantity of electric current which shall be charged in the relevant circuit, and be insulated adequately. All electrical cables inside the vehicle must be protected by means of overcurrent trips rated

according to the diameter of the individual conductors.

Every part of the electrical equipment including wires and cables must have a minimum insulation resistance between all live components and the bodywork.

- For equipment with up to 300 volts to bodywork, the insulation resistance must reach the following value: 250 k Ohm.

- For equipment with more than 300 volts to bodywork, the insulation resistance must reach the following value: 500 k Ohm.

The measurement of the insulation resistance must be carried out using a DC voltage of at least 100 volts. Tests should be carried out to validate and quantify the insulation resistance of the vehicle in wet conditions.

6.6 Insulation resistance

All electrically live parts must be protected against accidental contact. Insulating material not having sufficient mechanical resistance, i.e. paint coating, enamel, oxides, fibre coatings (impregnated or not) or insulating tapes are not allowed.

An electrically conducting chassis frame as well as the bodywork and safety structure must be connected to the Chassis Ground and insulated from Power Circuit Ground.

6.7 Power Circuit

In cases where the voltage of the Power Circuit exceeds 50 volts, this Power circuit must be electrically separated from the chassis (body) and from the Auxiliary Circuit by adequate insulators.

6.8 Power circuit wiring

The power circuit comprises the STSY, the converter (chopper) for the drive motor(s), the contactor(s) of the General Circuit Breaker, fuses, the generator(s) and the drive motor(s).

All cables and wires connecting electrical power components (e.g. motor, generator, chopper and STSY) with an ampacity of more than 30 mA must have an additional built-in sense wire or coaxial conductive shield that is insulated from the Power Circuit.

The sense wire allows the detection of insulation faults or broken power wires. In case of an insulation failure or a broken power wire, an electronic monitoring system must disconnect all energy sources (STSY and generator) from the power circuit, e.g. by the contactor of the General Circuit Breaker. The colour of all power circuit wires must be orange. Power Circuit wires exposed to stress (e.g. mechanic, thermic, vibration, etc.) must be secured within proper cable guides, enclosures and insulating conduits.

All open connectors of the Power Circuit must be capped. An automatic system must detect if a connector of the Power Circuit is uncapped or if a Power Circuit connector is disconnected in Live condition (disconnection of Live contacts can be detected by e.g. shorter alarm contacts within the power connector). In such a case, the STSY must be switched off immediately (within less than 50 ms) or disconnected from the Power Circuit.

6.9 General Circuit Breaker ("Emergency stop switch")

For speed events according to Article 2.2, all vehicles must be equipped with a General Circuit Breaker, of a sufficient capacity, that can be operated easily by a trigger button from the driver's seat when the driver is seated in a normal and upright position, with the safety belts fastened and the steering wheel in place, and from the outside, to cut off all electric transmission devices (all electrical circuits including the auxiliary power to the i.c. engine). Care must be

taken, however, that the installation of the circuit breaker does not result in the main electrical circuit being located close to the driver or the external switch.

For closed vehicles, the external button of the General Circuit Breaker must be located below the windscreen on the driver's side, i.e. on the left-hand side of the vehicle when facing in the direction of travel.

For open vehicles, the external button of the circuit breaker must be located on the left-hand side at the base of the main rollbar structure when facing in the direction of travel.

The button must be marked by a red spark in a white-edged blue triangle with a base of at least 12 cm.

The contactor must be a spark-proof model. In order to prevent contact melting of the contactor its [I²t] (ampere squared seconds characteristics, representing heat energy dissipated on the breaker contacts during switching) must be sufficient to guarantee proper operation of the General Circuit Breaker, even under surge current conditions, in particular those occurring during the connection of the STSY to the power bus.

In a minor crash where the emergency tensioning retractor is fired but without airbag deployment, the i.c. engine and all energy sources of the Power Circuit must be switched off automatically by electric switches or contactors.

FIA In a severe crash with airbag deployment, the i.c. engine must be switched off automatically and the energy supply cables must be disconnected automatically inside the traction battery compartment by pyrotechnical means.

6.10 Overcurrent trip (fuses)

Fuses and circuit breakers (but never the motor circuit breaker) count as overcurrent trips. Extra fast electronic circuit fuses and fast fuses are appropriate. Overcurrent trips must be fitted as close as possible to the STSY at both polarities inside the STSY compartment (see APPENDIX 4 A of the current FIA-AEC Technical Regulations) and also in an adequate location in each electric power circuit. Overcurrent trips must under no circumstances replace the General Circuit Breaker (emergency stop switch).

6.11 Battery Supervising Electronics

The Battery Supervising Electronics (BSE) is part of the battery pack and an important safety system. Many different chemistries for Li-Ion cells are on the market.

They are not at all the same. They all have different safety requirements. Therefore, the BSE must, in general, be appropriate for the battery chemistry, as recommended by the cell manufacturer.

For Lithium-Ion (Lithium Polymer) batteries prone to thermal runaway it is strictly prohibited to remove or modify the monitoring and safety electronics delivered by the manufacturer with each cell (or module). For Lithium-Ion (Lithium Polymer) batteries, only batteries equipped with an exclusive voltage monitoring and protective system to prevent overcharging and under-voltage at each battery cell shall be approved.

Furthermore, temperature control of the Lithium battery cells must be foreseen in the supervising electronics to prevent thermal runaway during overload or battery failure.

A separate and redundant surveillance unit in the storage system should monitor the cell voltage and temperatures to shut the system down at a single cell malfunction.

The assembly of the battery cells in a battery pack must be carried out by a manufacturer with the appropriate technology.

The specification of the battery pack, modules and cells, as well as a document from the said manufacturer attesting to the safety of the produced battery pack, must be verified and approved by the ASN in advance.

6.12 Driver Master Switch

All vehicles not having valid vehicle registration documents for public road use must be equipped with a Driver Master Switch.

The DMS must physically be removed when in the OFF position.

The DMS should be located on the dashboard.

The DMS may never substitute for the General Circuit Breaker.

6.13 Safe / Live Signage

The Safe / Live Signage must be activated jointly by both the Driver Master Switch (DMS) and the General Circuit Breaker (GCB).

If the Power Circuit is switched on (condition to drive the vehicle) by both the DMS and the GCB, the Power Circuit will be energised and turn to Live condition. Two redundant RED lights symbolising "danger high voltage" must be activated on the dashboard, as well as one red tail light to clearly show that it could be life-threatening to work on the Power Circuit.

If the Power Circuit is switched off by the DMS and/or the GCB, the Power Circuit will be de-energised and discharged (no voltage on Live components). Both red dashboard lights and the red tail light will be switched off to clearly show that the Power Circuit is dead and it is now safe to work on the vehicle.

ARTICLE 7 SPECIFIC TECHNICAL REGULATIONS FOR HYBRID VEHICLES FOR NON-SPEED EVENTS

The cars must be strictly series production, except for the provisions set out in this Article 7.

7.1 Engine

The only work which may be carried out on the vehicles is that necessary for its normal servicing, or for the replacement of parts worn through use or accident.

The limits of the modifications and fittings allowed are specified hereinafter. Apart from these, any part worn through use or accident can be replaced only with an original part identical to the damaged one.

Oversized pistons that accord with the workshop manual are permitted.

Other than explicitly stated in these regulations, all parts of the engine must be standard, including support and auxiliary units, such as air filter, alternator, fuel pump, valve cover, oil sump, baffles in the oil sump, oil and water coolers.

7.1.1 Ignition system

The make and type of the spark plugs and high voltage cables are unrestricted.

7.1.2 Cooling system

The cooling system may not be modified (e.g.: a belt-driven fan may not be replaced with an electrical system).

7.2 Exhaust system

The exhaust system as applied in series production must be used without modifications.

7.3 Transmission

The drive train (gearbox, final drive and differential) as applied in series production must be used without modifications.

7.4 Brakes

The brake systems (brake discs, brake drums, callipers, hydraulic system, brake electronics) as applied in series production must be used without modifications.

Brake pads are optional.

7.5 Suspension

All the suspension components, as well as the data for the setting of the track width, wheel camber, and caster, as applied in series production must be used without modifications. Shock absorbers are optional. The automatic level control of a vehicle originally fitted with shock absorbers must be maintained without any changes.

7.6 Wheels and Tyres

Only the wheel and tyre options given in the vehicle registration documents are allowed. Only steel and aluminium wheels are allowed.

The applicant/driver is obliged to produce supporting documents for the admissibility of the wheel/tyre combination used.

Spare wheels must be in compliance with the vehicle registration documents.

A compact spare tyre kept in the vehicle may be used as a spare wheel, but as long as the vehicle is in the competition, that wheel cannot be mounted on the chassis.

7.7 Bodywork

The fitting of underbody protections is authorised in rallies only, provided that these really are protections which respect the ground clearance, which are removable and which are designed exclusively and specifically in order to protect the following parts:

engine, radiator, suspension, gearbox, tank, transmission, steering, exhaust, extinguisher bottles. No other modifications to the bodywork are allowed.

7.8 Seats

FIA homologated seats according to the standard 8855/1999 are authorised for the driver and co-driver.

If the seats are modified, seat attachments and supports must be manufactured in accordance with Article 253-16 of Appendix J.

7.9 Disabled conversion, vehicle tool kit

Upon request, specific modifications to the vehicle for physically disabled persons may be approved by the FIA-AEC and must be documented in the Technical Passport.

The standard tool kit may be left outside the car during the event, if the minimum vehicle weight is not reduced.

7.10 Auxiliary electrical equipment

The auxiliary electrical equipment as applied in series production must not be modified.

Additional headlights are allowed, if the total number of forwardfacing headlights does not exceed 6. These headlights may be recessed into the front of the car body, but in that case they must completely fill the openings created.