

SCCA PROTOTYPE ELECTRIC (PE) RULES DRAFT

9.1.8.X PROTOTYPE ELECTRIC (PE)

Prototype Electric (PE) is a sports racing class that will be inclusive of converted existing race cars and new purpose designed cars that have been built using Electric Vehicle power technology and fit within these rules. Homologation may be required. Refer to section 9.2.2. for details. Some technologies are prohibited due to cost, safety, availability, and complexity. As these prohibited technologies individual status changes, they may be approved to aid in keeping the class current and attractive.

All vehicles must meet the requirements of the Supplemental Common Rules for Electric Vehicles (SCREV) as well as the details listed in this section.

It is not the intent of these rules to freeze the class in time but rather to encourage orderly and progressive change to keep the class current.

A. DATA COLLECTION

All PE Sports Racing Cars must have the AIM part #X47KPF-SOLO2R0 data box mount installed on their vehicle to provide the necessary mounting of the AIM Solo or Solo 2 data box. The mounting surface is to be approximately oriented either horizontally or vertically either parallel or perpendicular to the longitudinal axis of the car and must be accessible from the exterior of the car with the driver on board -- it should have a view of the sky, and not be located under carbon fiber or metallic bodywork. In addition, the mount must not be on wings, and/or wing end plates and where possible should be in the cockpit. Sufficient space should be left between the mounting plate and the surface to which it is attached to permit the use of zip ties/tie straps to restrain the data box to the mounting plate. The purpose of this requirement is to allow the placement of data boxes on cars on pre-grid by SCCA assigned personnel and the collection of the box when the car exits the racetrack. Contact AIM and their distributors for direct purchase. Data collection may be utilized to verify the Peak Power rating of the motor(s).

B. PE RULES RESTRICTIONS

The following technology/materials have been restricted due to the current economic viability, if these technologies should become mainstream and cost effective, then these rules should be updated to remove the restriction.

1. Alternate brake rotor materials (i.e., nonferrous).
2. Monoblock brake calipers.
3. Metal matrix calipers.
4. Carbon Fiber Springs.
5. Front and rear motors (AWD), or In-Wheel motors, with torque vectoring.

C. SAFETY EQUIPMENT

Shall comply with GCR Section in addition:

1. Exposed glass headlight lenses and bulbs on the front of the car are prohibited.
2. Brake lights are not required.

D. CHASSIS

Must meet all requirements of GCR section 9, Cars and Equipment, except as permitted in the P2 rules.

1. Allow for any form of chassis construction; tube frame and aluminum or steel monocoque chassis construction allowed, chassis fully composed of composite structural materials permitted.
2. Anti-intrusion panels allowed anywhere on the sides of the chassis. Materials and attachment are unrestricted.
3. Cars may be either single seat or two seat cars.

E. BODYWORK

Bodywork shall provide comfort and safety for a driver and passenger or for a driver only. All elements of the bodywork shall be completely and neatly designed and finished, with no temporary or makeshift elements. It is the intent of these rules to control the use of "ground effects" to achieve aerodynamic downforce on the vehicle.

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1. The bodywork as viewed from the front, sides and above shall cover all mechanical components tow hooks, jack points, radiators and mechanical components passing through ducts may be exposed. Wheels and tires may be exposed when viewed from the side. As viewed from the side, the bodywork shall extend over the full width of the tires for at least one third (1/3) of tire circumference. Rear tires may be exposed as viewed from the rear. Cycle-type fenders (which only cover the tire and are not continuous with the rest of the body) are prohibited. Fenders shall be firmly attached to the bodywork with no gap between body and fender.
 - a. Ventilation slots, louvers or exit ducts for extraction of the air from the top of the fenders are allowed. The tires shall not be seen as viewed from above, except through ventilation slots, louvers or exit ducts provided that the fore/aft opening through which the tire may be seen does not exceed 3/16 inches when viewed from above.
 - b. All forward facing openings must be connected to duct(s) connected to heat exchangers or brake cooling ducts. All air entering a duct must pass through heat exchangers or be used to cool motors, batteries, brakes and must not be used to generate aerodynamic downforce or any other purpose.
 - c. Ducts allowing air into the motor compartment are allowed, may be forward facing, and must not be used to generate aerodynamic downforce or any other purpose.
2. Height: No part of the vehicle having special or significant aerodynamic function shall exceed a height of 115cm (45.25 in) above the ground with the car in normal racing trim, driver aboard. The motor cooling intake shall not provide an aerodynamic downforce. Fairing of the safety roll bar is permitted.
3. Width: The maximum width as viewed from above shall not exceed 200cm (78.74 inches) including all aerodynamic devices. However, no portion shall extend more than 10cm (3.9 inches) beyond a plane tangent to the outer face of the front and rear wheels with tires. The minimum body width between the front and rear wheels shall not extend inwards beyond a vertical plane connecting the centerlines of the front and rear tires. All cars shall be at least 63 inches wide measured between planes parallel to a line tangent to the outer most face of the front and rear wheels or tires whichever is greater, unless otherwise specified.
4. Length: The maximum overall length shall be 485.3 cm (191 inches).
5. Overhangs: Front plus rear overhangs including wings, wing mounts, wing end plates, and splitters (tow hooks and jack plates are excluded provided they serve no other purpose) must not exceed 80% of the wheelbase. The difference between the front and rear overhangs must not exceed 15% of the wheelbase.
6. The outermost surface of side pods between the front and rear wheel openings must have a minimum height equal to the height of front axle centerline.
7. Cockpit:
 - a. The driver's seat shall be capable of being entered without the removal or manipulation of any part or panel except for a removable steering wheel and/or cockpit padding (except for those closed cockpit cars which are specifically allowed by the SCCA).
 - b. The cockpit opening shall comply with the following minimum dimensions for both single and two seat sports racers: Cockpit length: 60cm (23.662 inches) cockpit width 45cm (17.717 inches) maintained over 30cm (11.811 inches). The minimum rectangular opening may be measured anywhere forward of the main roll hoop. Forward-facing roll bar and roll cage bracing and padding, as well as lateral support and/or intrusion bars are not considered part of the dimensions above.
 - c. Seats shall be firmly attached in the car but may provide adjustment for the size of the occupant. The body surrounding the driver and passenger compartment shall be symmetrical about the longitudinal axis of the car.
8. Visibility: Bodywork shall provide visibility for the driver forward and to both sides adequate for racing conditions. Rear view mirror(s) shall provide the driver with visibility to the rear of both sides of the car.
9. Windscreens are optional.

F. AERODYNAMICS:

It is the intent of these rules to minimize the use of "ground effects" to achieve aerodynamic downforce on the vehicle. For this purpose, the "Control Area" is defined as the lower surfaces of the body and chassis that are licked by the airstream. This "Control Area" is located within the plan view rectangular area defined by the rear edge of the front tires and the front edge of the rear tires and the entire width car's lower surface facing the ground.

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The entrant shall designate a flat rectangular reference area with minimum dimensions of 30cm by 60 cm. This reference area is located on the underside of the car (the surface licked by the air stream) between the rear of the front tire and the front of the rear tire. The center of the reference area must be no more than 75mm from the longitudinal centerline of the vehicle. No point or surface on the "Control Area" (as defined above) shall be more than 25.4mm above or below the plane determined by the above defined reference area designated by the entrant and on a line perpendicular to that reference plane. The total distance between the lowest and the highest point on the defined underside of the car shall also not exceed a maximum of 12.7mm, except as specifically permitted herein. Compliance with these requirements shall be accomplished by placing a straight edge on the reference surface designated by the entrant and verifying that the requirements are met. A maximum of eight (8) rub blocks of maximum dimension 75mm width by 125mm length are allowed anywhere on the lower surface of the chassis and may extend below the reference plane. Fasteners such as bolt heads and rivets shall not be considered parts of the reference area or the "Control Area". Use of fasteners to circumvent this rule is not allowed. This rule is not to be interpreted as requiring a floor pan beneath the motor, transaxle, transmission, or final drive housing.

1. A rear diffuser is permitted beginning behind the front edge of the rear tires. The diffuser may be divided internally into multiple sections. The width of the diffuser, as measured inside the diffuser sides, shall not exceed the width between the rear tires in any lateral section of the diffuser. Strakes within the diffuser are allowed.
2. A rear wing of any shape or chord length is permitted. As viewed from the side, the wing and all attached elements (Gurney flaps or any other aerodynamic attachments) must, along its full length and at any individual measurement point, be fully contained by a rectangle measuring 6 inches by 13 inches. This measurement is to be made approximately parallel to the centerline of the chassis; the measurement rectangle is not required to be parallel to the ground. Wing support posts that serve no other purpose shall be exempt from this measurement.

Note: If a square or rectangular measurement fixture is used to determine compliance of wing or end plate size, the fixture must be flat, and the material thickness must not exceed 0.060 inches.

The maximum width of a wing shall not be wider than the maximum width specified for the body in D.3 above. A wing may be positioned anywhere behind the main roll hoop. The wing and end plates are to be measured as raced. Wing end plates may not be attached to the bodywork. Anything attached to or through a wing end plate is considered part of the end plate and thus must meet applicable dimensions.

3. Wings may be end plate mounted or post mounted.
4. End plates size is unrestricted except that they must be flat with 25.4mm (1 inch)
5. Aerodynamic devices shall be securely mounted on the entirely sprung part of the car and not be movable when the car is in motion.

G. WHEELS AND TIRES

Wheels shall have a minimum diameter of 10 inches. Left and right front tires will be the same size; left and right rear tires will be the same size.

H. BRAKES

1. Cars shall be equipped with a dual braking system operated by a single control. In case of leak or failure at any point in the system, effective braking power shall be maintained on at least two (2) wheels.
2. Brake calipers may be ferrous or aluminum alloy. A maximum of 4 pistons per caliper. Brake rotors must be ferrous materials, no other materials allowed.
3. Anti-lock braking systems are prohibited.
4. Regenerative braking may be utilized.

I. SUSPENSION

All parts shall be of steel or ferrous material, with the exception of hubs, hub adapters, bell cranks, pivot blocks, and bushes. Front and rear hub carrier and chain carrier material shall be steel, or aluminum alloy or magnesium. Titanium is prohibited.

1. Shock component parts of aluminum are permitted.
2. Springs: Ferrous material only.
3. Steering unrestricted.
4. Anti-roll bar linkages unrestricted.

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J. TRANSMISSIONS

1. Cars may use any manual, automatic or CVT gearbox up to 6 speeds. Direct drive of the wheels without an intervening gearbox is permitted.
2. Cars utilizing OEM drive units may separate the motor from the transmission. A separate transmission, or chain drive system with mechanical differential, may be used.
3. Internal gears in OEM drive units may be replaced with gears of a different ratio.
4. Cars must be able to be driven in reverse. Reverse may be accomplished through use of a reverse gear in the gearbox or through motor controller settings
5. Shift operation: all gear or motor controller changes must be initiated and completed by the driver
6. Differentials are permitted and are unrestricted with the following exceptions: Electronically adjustable differentials are not allowed, and manual adjustments are not allowed while the car is in motion
7. Utilizing computer control to activate individual brakes to provide a differential action, or torque vectoring, is prohibited
8. Power shall not be applied to more than 2 wheels.

K. BATTERIES

1. As specified in the SCREV, the RESS/Battery Pack(s) must reside within the vehicle roll structure. The vehicle side pod area may be utilized for battery pack mounting if a protective tube structure attached to the main chassis is added. The structure must protect the battery packs against damage caused by side impact and vehicle roll-over. The structure should be braced/triangulated to the main chassis. NASCAR style side impact bars, or one bar intersecting another to form an X is permitted. Tubing diameter is as required in the primary roll structure according to the vehicle weight.
2. RESS/Battery Pack mounting and cover requirements are as outlined in section 4 of the SCREV.
3. Battery construction details, Battery Management System, and Isolation Monitoring requirements are as outlined in Section 4 of the SCREV.
4. Maximum battery pack voltage is 420V. Maximum pack voltage is defined as the number of cells/modules in series x Manufacturer's maximum cell voltage.
5. Vehicles must utilize the same battery pack for Qualifying and Race. It is prohibited to swap battery packs with different capacities/weights during a race weekend.
6. Battery capacity is free.

L. MOTORS

1. Motors/Inverters may be utilized from:
 - a. Production based Electric Motorcycles
 - b. Production based Electric Vehicles
 - c. Aftermarket sources provided they are commercially available, and specifications and retail pricing are available online.
2. Motors and inverters must not be modified in any way except as noted below.
 - a. Production based inverter controller firmware may be updated/backdated with any OEM offering as long as it is not modified. CAN based supervisory controllers are permitted but shall not alter the torque/power curve.
 - b. Production based motors must utilize the stock inverter.
 - c. Internal dimensions and materials of the motors shall be stock.
 - d. Bolt-on covers and mounts external to the motors may be modified or replaced. Mounting for a support bearing and drive flanges may be added if separating an OEM motor from its transmission.
 - e. Cooling systems are free.
 - f. Internal motor machining of any kind is not allowed, i.e., machining of the armatures and other internal components is not allowed.
 - g. Motors rebuilds such as new bearing or other internal component must meet specifications in the factory service manual; no geometry changes are permitted
 - h. A maximum of two motors may be utilized. Motors may be mechanically stacked together as long as the total peak power does not exceed the allowable power specified in the PE Motor/Vehicle Weight table.
 - i. Dual motors independently driving two wheels is not permitted.
 - j. Traction control is not allowed.
 - k. Motors may drive either the front or rear wheels, but not both.
 - l. Hybrid operation is not permitted. No combustion motors may be utilized for any purpose.

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- m. Peak power ratings for OEM Production motors will come from manufacturer's published data. Peak power ratings for aftermarket motors will come from Manufacturer's published data sheets, or the Manufacturer's published torque/power curves for the given Battery Pack voltage.

3. TECHNICAL DOCUMENTATION

The competitor must have available for inspection a complete documentation package that has as a minimum the following:

- a. Motor peak power documentation
- b. Motor data sheets (if aftermarket)
- c. Complete vehicle wiring diagram (high and low voltage)
- d. Battery cell/module data sheets (if non-OEM Battery Pack)
- e. Photographs of RESS/Battery Pack with all covers off showing construction details (if non-OEM Battery Pack).
- f. Battery Management System manual and data sheet
- g. Isolation Monitoring System (if different that Battery Management System) manual and data sheet
- h. Main contactor data sheet
- i. Main fuse data sheet
- j. HV cabling data sheet
- k. Onboard, or offboard, charger documentation (if AC charger is used).
- l. Emergency Services Guide that shows as a minimum: The location of all HV components and wiring, Service Disconnects, Tractive System kill switches, Any "no-cut", "no-jack" zones for the vehicle.

M. PE MOTOR/WEIGHT TABLE

Spec Line	Motor Series	Total Power (kW)	Minimum Vehicle Weight (lbs.)	Notes
A.1	Production Motorcycle Motors	165	1300	Dual Zero Motorcycle Cypher III Motors mechanically coupled together or similar
A.2	Production EV Drive Unit	220	1500	2017 – Present Tesla Model 3 drive unit rated at 208kW or similar
A.3	Aftermarket, Commercially available	220	1600	Cascadia Motion iM-225 (HVVH250 with CM200DX Inverter) or similar
A.4				