

SPARC Restricted Class Regulations v1.0

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Events may choose to run classes with specific limitations. This document provides a ruleset for the most common class restrictions. A robot may be entered into any of the below classes if it complies with the additional rules in this section. As these are additional restrictions any robot may be entered in the standard class of the same weight if the restricted class it normally runs in is not in effect.

1. Sportsman Class

- 1.1. **Limitations on Spinning Weapons.** All devices rotating more than 360 degrees are allowed to operate with a tip speed at or below 20ft/s.
- 1.2. **Non-Standard Arenas.** Use of non-standard arenas (for example, open air or sumo style arenas) may require additional weapon restrictions and should be clearly noted on the event information page. Example restrictions for an open air arena:
 - 1.2.1. Slow spinners are allowed with an absolute maximum tip speed of 20 feet per second and may spin in any direction. The tip speed in feet per second is calculated by this formula: $\text{Tip Speed} = \text{RPM} \times \text{Diameter} \times .00436$.
 - 1.2.2. Additionally, any weapon systems that may be capable of tearing off pieces of the opponent (flippers, axes, etc...) must be cleared with the event organizer prior to competing.

(Approximate tip speed = no load RPM * diameter in inches * 0.00436) Weapon rpm will be measured by tachometer prior to the start of the event. Specific weapons of sufficiently high mass or moment of inertia (MOI) may be limited to lower speeds or disallowed by officials if they deem the weapon to be too destructive. Officials may require submission of specifications including motor, voltage, gearing ratio, weapon weight and dimensions prior to the event.

- 1.2.3. Sawing, drilling and other spinning weapons will be allowed to exceed the 20ft/s limit so long as they meet the following requirements:
 - 1.2.3.1. The effective tooth pitch for the saw or saw like weapon is ≥ 5 . (Effective pitch = tooth count / diameter) For example, a 10" saw blade with 60 teeth would meet this requirement. A 10" saw blade with 40 teeth would not. For abrasives the grit size will be used to determine if the requirements are met. (Tooth count = grit * circumference)
 - 1.2.3.2. Saws and saw-like weapons are limited to the manufacturer's rated RPM. If you are using a custom blade it will be limited to the rated rpm of an equivalent commercial blade. ($\pm 5\%$ on tooth

count, diameter, thickness) Additionally, the maximum spinning mass for saws and saw-like weapons is 15% of the total bot mass. This includes any mounting hubs, shafts, flywheels, pulleys, and other structures mechanically linked to the rotation of the saw blade.

1.2.3.3. Wheel-like and rubber spinning weapons are allowed without a specific tooth density requirement. Excessively destructive implementations may be restricted at the event organizers discretion.

1.2.3.4. All weapons operating above the 20ft/s limit must be submitted to the event organizer for approval during the registration period.

1.3. **Wedge Limitations.** Active wedges are allowed with no restrictions. A robot may only have a single passive wedge.

1.3.1. An active wedge is defined as a wedge that is articulated and actuated independently of the drive system.

1.3.2. A passive wedge is any wedge or wedge-like object (forks, series of small, hinged, independent wedges along the same face of the robot) that does not meet the requirements for classification as an active wedge.

1.3.3. At the event organizers discretion any weapons being primarily used as a passive wedge may be required to undergo modifications to reduce or remove this potential prior to continuing in a tournament should this use result in the robot being in violation of the restriction on the number of passive wedges permitted.

1.4. **Excessively Destructive Weapons.** Weapons deemed too destructive by virtue of their mass, MOI or other characteristics may be further limited or disallowed at the discretion of the event. Please contact the event organizer concerning your design to avoid problems.

1.5. **Standard SPARC Rules Apply.** Unless otherwise stated, all other standard SPARC rules will apply. This includes walkers and their weight bonuses. However, a walker that uses the weight bonus for a spinning (or other) weapon that is too destructive will be disqualified.

2. Plastic Class

The spirit of this class is to create an accessible and affordable class that encourages experimentation and rapid iteration by utilizing 3D printing.

2.1. Allowed materials

2.1.1. Frames, weapons and other custom parts may only be made from PLA, PLA+, PET, PETG, PCTG, ABS, or ASA and must be FDM/FFF 3D printed.

2.1.2. Materials that are functionally identical to PLA+ but have a different name for marketing purposes will be considered PLA+ when determining legality. (ex. PLA Pro, Super PLA)

- 2.1.3. No other types of plastics or materials are allowed (ie. metal, carbon fiber, UHMW, etc).
- 2.1.4. Composite and blended materials that use legal materials as a base are not permitted. Examples include but are not limited to: Carbon Fiber PLA, Glass Filled ABS, and Flex PLA.
- 2.2. COTS Parts
 - 2.2.1. Commercial Off The Shelf parts can be made from any material. This includes components such as motors, electronics, axles, bushings, bearings, fasteners, and adhesives.
 - 2.2.1.1. COTS parts may not be used outside of their typically accepted function. Examples include:
 - 2.2.1.1.1. Permitted: Using shafts and bearings to allow wheels or a weapon to spin freely, using screws to attach two parts together.
 - 2.2.1.1.2. Not Permitted: Using COTS parts as counterbalances for weapons, as weapon impactors, or as armor.
 - 2.2.1.2. COTS parts may be modified if necessary so long as the function of the part is not significantly changed. Examples include shortening motor shafts and adding flats for set screw contact.
 - 2.2.1.3. COTS equivalent parts are allowed.
 - 2.2.1.3.1. Examples of COTS equivalent parts include but are not limited to builder sourced/manufactured gearmotors, custom electronics, prototype components, and axles that are not commercially available.
 - 2.2.1.4. Magnets to enhance traction or downforce are prohibited.
- 2.3. Tires, Wheels and Other Traction Elements
 - 2.3.1. Non-allowed materials may be used if they meet the following requirements:
 - 2.3.1.1. Tires and other traction elements may be made from COTS rubber material, custom cast rubber, rubber coatings, or foam.
 - 2.3.1.2. Parts between motors/shafts and Tires should either be COTS, Foam, or printed from Allowed Materials.
 - 2.3.1.3. Printed elements including COTS components must be from the allowed materials list.
 - 2.3.1.4. Tires, wheels, wheel components, and other traction elements made from materials not on the allowed materials list may not be designed such that they provide more armor or structure than a COTS equivalent part.
- 2.4. Coatings and Post-Processing
 - 2.4.1. Painting or otherwise marking robots is permitted if done solely for aesthetic purposes. Excessive coatings are subject to event organizer review and approval.

- 2.4.2. Post-processing of materials using techniques that enhance durability is not permitted. Disallowed processes include but are not limited to annealing, acetone soaking, and boiling of parts.
- 2.5. Robots may be disqualified at the Event Organizer's discretion if it is deemed to violate the spirit of the class. Contact the event organizer ahead of time if you are not sure your robot meets the above definition.