Section XII: Fast Electric (FE) Class

Revised March 31, 2023

Goal: To establish a set of rules and specifications for electric power systems and racing formats that will allow FE scales to race and have fair and equal competition.

A. The Fast Electric (FE) class is established as an additional class in R/CU.

B. The Fast Electric class shall follow the overall rules for R/CU, and the additional rules established in Section XII. In case of conflict in rules between Section XII and other Sections, the Section XII rules shall apply in the FE Class.

C. The technical rules of the Fast Electric class will be reviewed on an annual basis by the R/CU Board. The technical rules review will take place after the yearly race season and before the end of the calendar year. The final decision on proposals will be issued no later than January 31st of the following calendar year. Technical proposals may be made to the Board at any time but will only be considered at the technical review meeting(s) during the above-specified time. Technical proposals may include modifications to the approved motor, battery or speed controller list or specifications.

D. Technical Rules

1. Power and drivetrain

- **a.** Approved motors:
  - **i.** NEU 1527 1.5Y 850KV
  - **ii.** HET Typhoon 700-98 840KV
  - **iii.** Turnigy SK3-3994 850KV
  - **iv.** TP 4040 10Y 830KV
  - **v.** TP 4060 6Y 860KV
    1. Approved as a test motor for 2020.
- **b.** Motors not on the approved motor list:
  - **i.** Shall not exceed the manufacturer's KV rating of 860 KV.
    1. If the motor case is not clear marked with the manufacturer's KV rating, the owner should be prepared to provide documentation of the maximum KV rating of the motor.
  - **ii.** May not have a motor case exceeding the following dimensions:
    1. Length: 105 mm (4.134 in.), this includes any bearing protrusions.
    2. Diameter: 42 mm (1.654 in.).
- **c.** Twin motors are not allowed.
- **d.** Drive line: either cable or hard shafts may be used, no gear boxes allowed.
- **e.** Any propeller may be used up to maximum of 57MM in diameter.

2. Electronic Speed Controls (ESC)

a. Any ESC may be used as long as it is rated to a minimum 130 Amps and rated to handle a minimum of 8s battery configuration.
b. Anti-spark resistors are advised on all speed controllers.

3. Batteries
a. A maximum capacity of 8S Lithium Polymer (LiPo) batteries are approved. Only LiPo batteries with a cell rating of 4.20 or less volts per cell are approved. Maximum charged voltage is 33.84 volts.
b. LiHV batteries with per cell capacities to 4.35 volts or higher are not approved.

E. Brushless Motor KV Output Inspections

1. The following formula will be used to determine a brushless motor KV output.

$$KV = \frac{RPM}{VOLTAGE \times 1.414 \times 0.95}$$

Supplemental formulas and variables:

$$RPM = f \times \frac{2}{p} \times 60$$

f = frequency of the motor, as measured in hertz (Hz)
p = number of poles in the motor
$VOLTAGE$ = voltage measured across the motor, as measured in volts (V)

1.414 is used to convert RMS voltage to peak voltage
0.95 is used to account for measurement error

2. It is recognized that identical technical inspections of FE motors can provide different results for two or more identically represented motors. Because of this, R/CU is using 950 KV as a threshold where no motor can exceed this KV output. After the 2020 race season, this will also apply to motors on the approved motor list.
3. For regular R/CU race events, the technical inspection of an FE motor will only be required if the boat in question is challenged by two other racers at the event. Technical inspections may be done without removal of the motor, via a multimeter with a drill motor attached to the drive shaft with the propeller removed. This process is outlined in Section F.

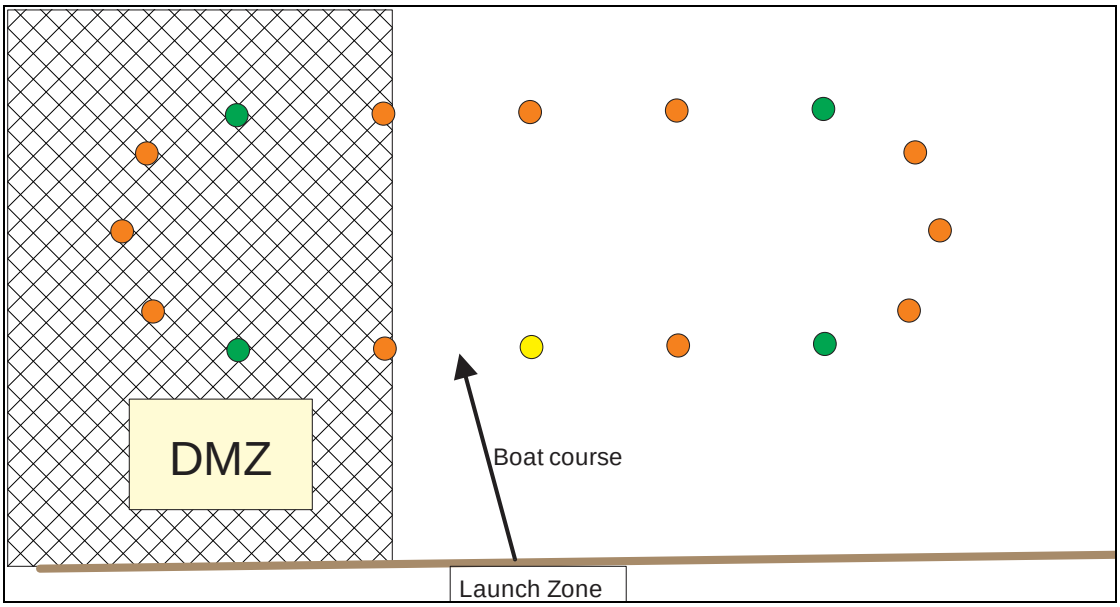
F. Technical Testing Process for Determining a Brushless Motor KV Output:

1. Tools/motor information/KV formula needed for testing.
a. Drill motor capable of at least 1200 RPM.
b. Multimeter with frequency-checking capability.
c. Number of poles on the motor to be tested (I.E. 2, 4, 6).
d. Formula as stated in Section E.
2. Testing the motor KV output:
a. Attach the multimeter leads to any 2 of the 3 wires extending from the motor.
b. Connect the motor shaft to the drill motor chuck. This can be done by removing the motor from the boat and direction attaching the drill chuck to the rear of the motor. If the motor is still in the boat, remove the propeller and attach the drill chuck to the stub shaft/cable driveline.
c. Set the multimeter to “Frequency” mode and spin the motor with the drill until the reading is shown. Record the frequency.
d. Set the multimeter to “Voltage” mode and spin the motor with the drill until the reading is shown. Record the frequency.

3. Plug the frequency into the equations provided in Section E. The result is the motor's KV output.

G. Racing Rules

1. Procedure for starting a race



   a. A starting clock of 1 minute and 40 seconds will be used for the FE class.
   b. All boats must be in constant forward motion by the 30 second mark and will remain in constant forward motion until the start of the race. A one lap penalty will be assessed for violations.
      i. All FE boats must enter the course from the launch zone and proceed to the left of the Start/Finish buoy and to the right of the first straight away buoy after the Start/Finish buoy. Then, the boat must go directly to the back straight away, then all the way around the right turn and back to the start/finish line. This a legal mill start. Failure to enter the course correctly will result in a "full mill" requirement (definition of a FE full mill requirement is running the mill course with no cutting to the back straight away until passing the start/finish buoy).
      ii. Entering the DMZ before the 30-second mark will result in a full mill requirement. Entering the DMZ after the 30 second mark will result in a one lap penalty.
      iii. As the clock counts down to zero and the boats are heading to the starting line, as they come out of the right turn, each must stay in the lane they have chosen until they pass the start line, then a proper overlap must be established before any lane changes can occur.
      iv. Any changes to the FE Milling Course will be announced at the Driver's meeting.

2. Heat Racing
   a. Any FE boat that can continue to race after an incident may be allowed to, but only after it has given the right-of-way to all other boats in the vicinity and can do so without impeding a fellow racer. If the boat interferes with another boat, a one lap penalty will be assessed.
   b. Definition of a "called dead FE boat:" when it is apparent that the boat can no longer proceed to race, the Contest Director or the individual calling the heat can call the boat dead.

c. For all other rules of racing, refer to R/C Unlimiteds Rule Book.

H. Safety Rules

1. Lipo battery packs must be charged in a safe manner on a flameproof surface, or in a LiPo safe charging bag. A dry fire extinguisher or extinguishing agent, such as a bucket of sand, must be kept near wherever batteries are being charged.
2. Only FE racers shall be allowed to retrieve any dead FE boats after a heat or test session.