

BRCA Electric Board Rules 2025.

Updated - **Nov. 2024**

The BRCA Electric Board will be known by the acronym EB.

NOTE:

As advised in 2011, the older technologies of NiCd/NiMH Batteries and Brushed Motors are no longer submitted for inclusion on the homologation lists that the EB maintain. Consequently, the rules covering these technologies have been removed from the following pages and are no longer published in the Handbook. The rules and homologation lists covering these items will remain available on the BRCA website.

1. Electric Board Principles.

1.1 The powers of this committee are exclusive to the areas of electric motors, rechargeable batteries, electronic speed controllers (ESC's) and any electronic devices used in the control of electric scale models. It will serve the BRCA sections that use these items.

1.2 All BRCA Sections that use items listed in (1.1) above are entitled to be represented on the EB.

1.3 The EB will draw up homologation lists for Motors, rechargeable Batteries and Electronic Speed Controllers (with zero timing) that are for the use of the BRCA Electric Sections.

1.4 The EB will investigate tools and procedures and provide such to the BRCA Sections to enable them to control the use of items on homologation lists. Funding for this will be raised from homologation fees.

1.5 The EB will not allow the use of any components that would compromise any single section's rules, but any single section may choose not to allow the use of items on the homologation lists.

1.6 All findings, homologation lists or announcements will be published on the official BRCA website.

1.7 Anything not itemised by the EB on the relevant homologation lists is specifically not allowed for use at BRCA Sanctioned events for Classes that use specific lists.

1.8 The EB reserves the right to remove products from the relevant homologation lists, if it is found that :-

Items are not readily available for purchase within acceptable lead times.

The technical specification/design differs from the homologated sample.

Incorrect information being supplied relating to any item.

This would not include items that ceased to be available due to being superseded by new products.

1.9 Any proposals to the EB for changes to principles or any rules have to come via. an Electric Section which is associated with the EB. All proposals will be circulated to all Electric Sections before a decision is taken.

2. Homologation Procedure & Price Limits.

2.1 Before any item is added to an homologation list, the BRCA Electric Board Homologation Officers will need to be satisfied that any new Motor, Battery or ESC submitted for approval, has originated from a recognised distributor and will be available for purchase via. a UK outlet.

The EB will review and set maximum retail price limits for Motors and Batteries. These prices may be amended, subject to any UK fiscal changes.

The maximum retail prices for the year starting 1st. April 2024 are as follows :-

2S Lithium Based battery pack (max. 7.6v) -- £95.00

1S Lithium Based battery pack (max. 3.8v) -- £65.00

Modified Brushless Motor. -- **£105.00**

'Spec.' Brushless Motor. -- **£105.00**

NOTE: The EB can review the above maximum prices. If it is decided that exchange rates dictate, the EB may adjust these prices during any year.

Motors:

2.2 Manufacturers, Importers and Distributors should note, that if a range/type of motor is to be retailed with a choice of magnetic rotor design, then a sample of each rotor design must be submitted. Any design variants are required to be submitted for homologation before being allowed at BRCA sanctioned events. All variants homologated must be available for retail purchase, before being added to the relevant homologation list.

New Motors (or Option Rotors) submitted for homologation/approval should be sent to :-
Paul Worsley, 23 Prince Rupert Road, Stourport-on-Severn, Worcs. DY13 0AS.

Motor homologation fees :- All motors £40.00. Payable to the BRCA.

This fee is applicable to :-

- Modified motors – Any individual type or range of motor.
- Spec. (Stock) motors -- Each 'wind' class within any type or range of motor.

The motor(s) will be included on the homologation list when the EB Homologation Officer is satisfied with the eligibility and availability of the motor.

Starting Jan. 2020; Motor Homologation Lists will only be updated and published once each month on the first Monday of the month. Samples are required a minimum of three weeks prior to this date along with all data required for homologation. The motor(s) will remain on the relevant homologation list for a minimum period of five years from the date of first registration with no further fees being payable during this time.

2.3 Manufacturers and distributors are requested to review the homologation lists and advise the EB Homologation Officer when a particular type or range ceases to be available for sale. Archive lists will be maintained on the BRCA website for these items. It is not intended that previously homologated motors cease to be eligible when removed from current lists – event scrutineers should not disqualify competitors using old motors which have previously been approved.

Batteries – Lithium Based (LiPo/LiFe) Packs:

2.4 New Batteries submitted for homologation/approval should be sent to :-

Paul Worsley, 23 Prince Rupert Road, Stourport-on-Severn, Worcs. DY13 0AS.

The BRCA Electric Board will not homologate any Lithium battery that exceeds the energy capacity allowed on passenger airline travel (currently 100Wh.). This maximum capacity is subject to any change by the airline industry.

Any new LiPo/LiFe battery has to be received by the BRCA Electric Board Homologation Officer by :-

- 4S -- 1st. Dec. latest.
- 2S -- 1st. Dec. latest.
- 1S -- 1st. Dec. or 1st. July latest.

LiPo/LiFe Homologation fees:-

- 4S Battery -- £40.00. (For each individual battery submitted). Payable to the BRCA.
- 2S Battery -- £40.00. (For each individual battery submitted). Payable to the BRCA.
- 1S Battery -- £40.00. (For each individual battery submitted). Payable to the BRCA.

Each individual battery must be supplied with:-

- a) A valid safety test certification in accordance with; UN Manual of Test and Criteria ST/SG/AC.10/11/Rev.8 (Rev.7 inc. Amend. 1 accepted), Part 3, Sub-Section 38.3, Tests T1 to T8.
- b) Technical Spec. sheet detailing the recommended charging rate, the maximum voltage when charging, case material, case wall thickness and method of sealing the case, the battery weight (max tolerance +/- 4%).
- c) Name and contact details for the appointed distributor in UK and the date when new batteries will be available for retail sale in UK.

2.5 Subject to 2.1 & 2.4 (above), the new battery will be included on the BRCA homologation list(s) and will be allowed at BRCA sanctioned events from:-

- 4S Batteries -- 1st April following addition to the list.
- 2S Batteries -- 1st April following addition to the list(s)
- 1S Batteries -- 1st April following addition to the list, when submitted 1st. Dec.
or -- 1st. Sept. following addition to the list, when submitted 1st. July.

The interpretation being that new batteries will NOT be homologated during the 'Racing Year' or season for any Section.

Zero Timing (Blinky) Speed Controllers (ESC's).

2.6 New Zero Timing (Blinky) ESC's, or any program updates submitted for homologation and approval should be sent to :-

David Gale, 15 Maxwell Crescent, Duston, Northampton, NN5 6UU.

Zero Timing (Blinky) Homologation fees :- Each ESC or program update -- £40.00. Payable to the BRCA.

Starting Jan. 2020; the ESC (Blinky) List will only be updated and published once each month on the first Monday of the month. Samples are required a minimum one month prior to this date along with all data required for homologation.

3. Rules – Rechargeable Batteries.

Individual Electric Sections will decide which battery type (eg: 1S, 2S or 4S) is used within their classes of racing at BRCA Sanctioned events.

Lithium Based (LiPo/LiFe) Battery Packs:

The storage, charging and use of Lithium based batteries (LiPo/LiFe) can give rise to serious safety implications. The BRCA will publish guidelines for the safe use of these batteries on the BRCA website. It is imperative that the guidelines are studied and adhered to.

3.1 Lithium based (LiPo/LiFe) battery packs must have a hard protective case that completely envelopes the cell(s). The case should be made from ABS or a similar material. The two halves of the case must be factory sealed in a way that any attempt to open the case will destroy the case. The only opening in the case that is allowed, is for the exit of wires or pin type connectors.

3.2 All Lithium Based (LiPo/LiFe) Batteries must comply with the weights specified on the BRCA homologation list. The maximum tolerance for manufacturers is +/- 4%.

The maximum external case sizes allowed, including any manufacturer incorporated plugs or connections are as follows:

4S Batteries: (Stick):

Length: 139.0 mm.

Width: 47.0 mm. (The max. width includes any side exit only wires).

Height: 48.2 mm. (Chassis location features extra to this dimension are allowed).

2S Batteries: (Stick & Saddle):

Length: 139.0 mm.

Width: 47.0 mm. (The max. width includes any side exit only wires).

Height: 25.1 mm. (Chassis location features extra to this dimension are allowed)

Saddle-Pack cells are allowed, and must comply with the above width and height dimensions.

Saddle-Pack cells must have a combined length dimension of 139.0mm max. when placed end to end.

1S Batteries: (Stick):

Length: 93.0 mm.

Width: 47.0 mm. (Side exit wires are allowed outside this dimension)

Height: 18.5 mm. (Chassis location features extra to this dimension are allowed)

3.3 Individual cells used in the construction of the battery pack will be rated with a nominal voltage of no more than :- (LiPo 3.8v, LiFe 3.3v). Individual cells may be wired in parallel.

For 4S Batteries: The maximum connection 'In Series' is four, to give a Final pack nominal voltage of no more than :- (LiPo 15.2v, LiFe 13.2v).

For 2S Batteries: The maximum connection 'In Series' is two, to give a Final pack nominal voltage of no more than :- (LiPo 7.6v, LiFe 6.6v).

For 1S Batteries: Cells can only be connected in parallel, to give a Final pack nominal voltage of no more than :- (LiPo 3.8v, LiFe 3.3v).

(Previously approved 3.7v nominal cells are also allowed).

The maximum charging cut-off voltage will remain at 4.20v per. cell.

3.4 The battery pack shall have leads extending from the case for the positive and negative electrical connections using wire of adequate size to handle discharge rates acceptable to racing

applications. Alternatively, the case shall have internal connection points for these wires clearly marked positive and negative so the user can apply the lead wires. Any type of metal connections that are incorporated in the battery pack by the manufacturer must be substantially below the major surface of the plastic casing, to prevent any 'short circuit' if placed on a conductive surface. Any type of connection adaptors added, that are conductive and protrude above the level of the plastic case must be removed before the battery is removed from the car. It is strongly advised that the link wire for Saddle Pack cells utilises a plug which will separate with any undue force.

3.5 The case must have the original suppliers label intact stating:

The unique Part # for the pack, the rated nominal voltage, the chemistry (LiPo/LiFe), the 'C' rating and the rated energy capacity in Wh. The brand name/logo shall be easily readable.

3.6 All LiPo/LiFe batteries must be charged using a LiPo/LiFe-capable charger using the industry standard CC/CV (Constant Current/Constant Voltage) charge profile.

3.7 LiPo/LiFe batteries may be charged to a maximum of:-

4S Batteries may be charged to a maximum of 16.80v (LiPo) resp. 14.80v (LiFe).

2S Batteries may be charged to a maximum of 8.40v (LiPo) resp. 7.40v (LiFe).

1S Batteries may be charged to a maximum of 4.20v (LiPo) resp. 3.70v (LiFe).

LiPo/LiFe drive batteries must be a 'Lipo sack' at all times when being charged or discharged.

This applies to any discharging procedures except during a race or when using organiser supplied resistors.

LiPo sack is defined as a receptacle designed for the purpose of charging LiPo/LiFe batteries and of a suitable construction as to contain a LiPo/LiFe fire.

Overcharging is a serious safety hazard and will not be tolerated.

3.8 Any competitor found to be charging cells using a charger that is not specifically designed for LiPo/LiFe batteries, or using a charge profile other than the industry standard CC/CV, will be penalised at the event.

Any competitor found to have charged LiPo/LiFe batteries to above the maximum voltage values as detailed in 3.7 (above) will be penalised at the event. Section Officials are advised to monitor these procedures and act accordingly.

3.9 Modification to the original battery case by removal of material or any modification that could be deemed to affect safety is not allowed.

3.10 The use of any additional heating of any type to heat a LiPo/LiFe Battery is not allowed. The use of any cooling devices or "freeze" sprays of any type to cool a LiPo/LiFe battery is not allowed.

3.11 It is strongly recommended that charging rates of Lithium based batteries are restricted to a maximum of '1C', as advised by manufacturers to maintain lifespan and reliability. From 2017 the 'maximum' recommended charging rate given by the manufacturer will be detailed on the homologation lists.

4. Rules – All Classes of Electric Motors.

4.1 There are currently two Classes of Electric Motors, for which the EB approve and control homologation lists. (The older technology 'Brushed' Motor homologation lists will remain available on the BRCA website). The current Classes being:-

Modified Brushless Motors.

'Spec.' Brushless Motors (10.5T, 13.5T, 17.5T, 21.5T).

All Brushless Motors have to comply with the rules in this section (4) and further rules detailed in sections 5 (for Modified Motors) or 6 (for Spec. Motors).

4.2 All motors must meet BRCA specifications before they will be approved by the BRCA Electric Board. Newly approved motors must be included in the homologation lists published on the BRCA website prior to being legal for use in BRCA sanctioned meetings.

4.3 If an approved type/range of motor is changed in any substantial way, it must be resubmitted for approval with a different item Part Number to the original, and must be available at UK outlets incorporating such changes. Examples:- Sleeve/Can and End-Cap designs, Sleeve/Can colour,

label design, stack or stator designs, rotor designs or design change of any of the major components or assemblies. Any variants of interchangeable components produced by the motor manufacturer, must be available at UK outlets and be submitted for approval before being allowed. Approval of 'optional parts' will be limited to: Rotors and minor feature changes (eg. timing adjustment or optional metal End-Cap). Only items that are listed as 'optional parts' on the relevant Motor Class homologation list are allowed. No modifications, design changes or removal of materials are allowed to any approved motor.

Motors used must be :- as produced by the original manufacturer without modification and starting 01.03.18 any variation must be within BRCA price limits, (other than using approved optional parts).

The only exceptions to the above being:- it is allowed to change the following wearing items, but they must be of similar design and materials to the original parts supplied by the manufacturer in the motor submitted for approval :- screws, threaded timing retainer clamp, or bearings (which must be the same dimensions as original).

Addition or removal of 'screw-fixing' or 'clip-on' heatsinks is allowed. Change of Timing End-Cap colour is allowed providing all design features are maintained.

4.4 The swapping of components between approved motors, (a.k.a. hybrids) is not allowed.

4.5 All approved motors are subject to checking at any time by the BRCA Homologation Officer to verify that they are still in compliance with BRCA specifications.

4.6 All motors used in BRCA sanctioned meetings must have their original motor builders label(s) substantially intact to be eligible.

4.7 It is the competitors responsibility to ensure that any motor used at a BRCA sanctioned event complies with all BRCA rules. If any motor is found to NOT comply with the BRCA motor rules, any results using such motor can be disqualified, regardless if the motor is included on the BRCA homologation list. If there is definitive proof available; that the motor manufacturer supplied a motor (to the UK distributor or competitor) that does not comply with BRCA rules, then sanctions could be taken against the specific manufacturer(s).

5. Rules - Modified Brushless Motors.

The following rules have been agreed by EFRA and various International organisations.

5.1 All motors are subject to the rules in section 4.

5.2 Sensored or sensorless motors are allowed.

5.3 The motor has to be rebuildable. Ball bearings are allowed. The motor must be constructed to allow easy replacement of the: rotor, bearings and front end-bell/plate.

5.4 If the motor is sensored:-

It must use a six position JST ZH connector model number ZHR-6 or equivalent connector with 6 JST part number SZH-002T-P0.5 26-28 awg. contacts or equivalent.

Wire sequence must be as follows:-

Pin #1 - 0V

Pin #2 - Phase C

Pin #3 - Phase B

Pin #4 - Phase A

Pin #5 - Temp control, 10k Thermistor referenced to 0V potential.

Pin #6 - VCC Nominally 5V, but may be 3.3V-6V.

Compatible speed control must use the 6 position JST header part number X-6B-ZR-SMX-TF (where the X denotes the style of the header), or equivalent.

The motor power connectors have to be clearly marked A, B, C.

A for phase A. B for phase B. C for phase C

5.5 The Can. (Based on `05` size specifications).

The overall dimensions of the assembled motor do not include :- solder tabs, lead wires, sensor plug or the original manufacturer's logo or name.

Overall maximum diameter is 36.02mm measured at whatever point yields the maximum dimension. Overall minimum diameter is 34.0mm measured at whatever point yields the

minimum dimension. Maximum length is 53.0mm measured from the mounting face of the motor to the furthest point of the end bell. Minimum length is 50.0mm measured from the mounting face of the motor to the furthest point of the end bell. Motor mounting holes must be on nominal 25.0/25.4mm centres.

5.6 Can design requirements to allow verification of stator sizes, design and construction.

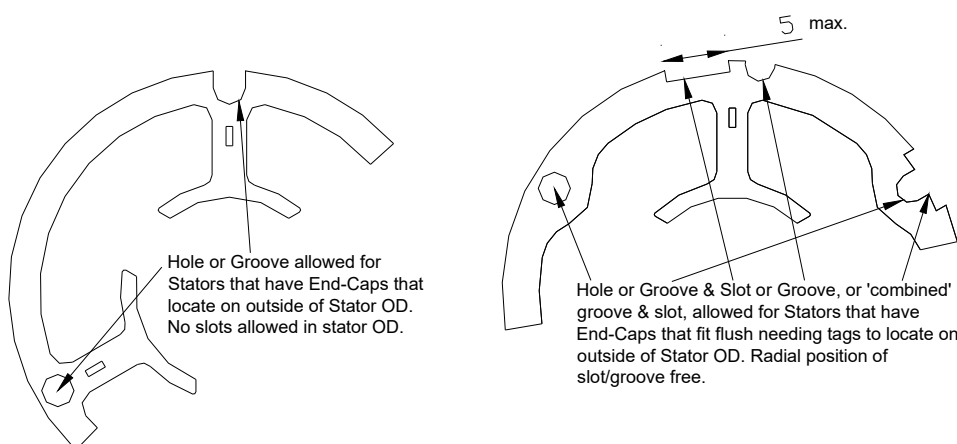
This rule has been updated several times to accommodate various manufacturer design changes:

- a) Motors homologated before 2012 were not required to have any holes or slots for stator verification. Stators did not have to be 'easily removable'.
- b) Motors homologated starting 2012 were required to have:- If the stator cannot be easily removed from the assembled motor, then the Can/Casing must have slots or holes that will allow measurement of the stator length and slots or holes to allow visual appraisal of the stator laminates.
- c) Motors homologated starting 01.03.18 were required to have:- If the stator cannot be easily removed from the assembled motor, then the Can/Casing must have minimum two pairs of slots or holes, each exposing 3mm of stator ends minimum, in line with the centre-line of the stator, that will allow measurement of the stator length and slots or holes to allow visual appraisal of the stator laminates.
- d) Starting 01.03.21, any new motor submitted for homologation must have a minimum of one (1) full length slot in the motor casing, parallel to the centre-line of the stator, to allow all laminates to be viewed. The slot(s) must have length and width dimensions sufficient to allow stator length measurement using conventional measuring tools.
- e) Starting 01.01.25. Whilst the design of the Can/Casing or separate End-Caps is not restricted, these items must be of a circular design with the outer circumference unbroken in area's diametrically opposite, to allow direct measurement of the outer diameter at several points with conventional instruments.

Older motors approved under: a), b), c) retain their homologation status.

5.7 The Stator : Slot-less stators are not allowed. The stator must be continuous laminations having the same overall design and shape, being one after the other without anything in between. The laminations must be of one homogeneous material without cut-outs, holes or hollow sections other than for the three slots for copper coil wires and (if needed) the three grooves or holes for the screws used to hold the entire assembly together.

If the motor design comprises of a stator assembly with separate End-Caps directly clamped flush to the stator end laminates, it is allowed for the stator laminates to have maximum three (3) slots or grooves at maximum width of 5.0mm. in the stator outer circumference, to locate the End-Caps concentric with the stator. These location slots or grooves can be incorporated in the area used for clamping screws, or in an area of the circumference separate from the grooves or holes used for clamping screws. All laminates must include any slots or grooves used. No other slots in the stator outer circumference are allowed.



Stator minimum length 19.30mm, maximum 21.00mm, measured across the metal surfaces of the laminates and not including any coatings. The faces of the end laminates of the stator must be free of any coatings or mouldings for minimum 1mm from the outer circumference to allow direct measurement across the metal faces of the stator ends (applied to any new motor range submitted from 01.03.18). The outer circumference edges of the end laminates must be complete with no material removed, to allow accurate measurement.

The thickness of the stator laminations is 0.35 +/- 0.05mm. All laminations must be of the same material.

The Inside diameter of the stator must accept 'plug gauges' of 12.50mm min., 16.00mm max. with the 'plug gauge' concentric to the motor can.

NOTE : Whilst all laminates in the stator must have the 'same overall shape/design', removal of sharp edges is allowed in the winding area on the end laminates (only) to offset damage to wire coatings. This is clarified as follows:- The top and bottom laminate in the stator stack of Brushless Motors covered by these rules may be deburred or chamfered, only on the wire winding web/leg, so long as the overall thickness of these end laminates is the same as other laminates in the stator and so long as the overall measured width of the wire winding web/leg of these end laminates is the same as other laminates in the stator. This requirement effectively restricts any deburring or chamfering to only the top and bottom laminates in the stator.

5.8 The Winding: Only three slot (phase) "Y" (star) or delta wound stators are allowed. Only circular (round) pure copper wire permitted. No turn limit.

No solid glue or 'filler' can be added to the wires of the final winding assembly. When the stator has been 'cut' to gain access to the wires, unwinding of the wires must be possible by normal 'hand' procedures. A small amount of lacquer added to the winding is allowed providing unwinding by hand is possible.

5.9 The Rotor: Shaft diameter must be 3.175mm where the pinion gear locates. Only one piece, two pole Neodymium or Ferrite magnetic rotors are permitted (bonded or sintered). Magnet minimum length 23.00 mm, maximum 27.00 mm., not including any non-magnetic balancing aids. Magnet minimum diameter 12.00mm, maximum 15.50mm. The original Rotor can be changed providing the replacement: complies with the above specifications, has been approved, is supplied by the motor manufacturer and is available retail. Only rotors detailed on the homologation list can be used.

Starting 01.04.15 onwards, the rotor will be identified with the manufacturers name or logo and the unique part number of the rotor. This applies to all rotors in new motors or new optional rotors. Rotors approved before this date (without identification) retain approval.

Starting 01.03.21 onwards, any new motor or new optional rotor submitted for homologation must have the unique part number of the rotor etched/stamped on the external flat area of the rotor shaft (where the pinion is located). This must be the listed part number for the rotor as shown on the homologation list (multi-digit numbers can be adjusted to give the significant numbers). Rotor sizes/dimensions are not acceptable.

5.10 All motors must have the original manufacturer's logo or name moulded/engraved by the manufacturer into the end bell/plate.

6. Rules - Spec. Brushless Motors. (21.5T, 17.5T, 13.5T and 10.5T)

The following rules have been agreed by EFRA and various International organisations. Motors in the Brushless Spec. classes have specific design features that differ from modified versions.

6.1 Brushless Spec. motors are subject to all rules in section:- **4. Rules - All Classes of Electric Motors**. Brushless Spec. Motors must also comply with section:- **5. Rules – Modified Brushless Motors**, with the following exceptions.

6.2 Only sensed motors are allowed in the Brushless Spec. classes. Sensor connection requirements are as **5.4** (Brushless Modified)

It is not mandatory that sensed Speed Controls have to be used, or that the sensor 'harness' has to be connected.

6.3 Can design requirements to allow verification of stator sizes, design and construction.

This rule has been updated several times to accommodate various manufacturer design changes:

- a) Motors homologated before 2012 were not required to have any holes or slots for stator verification. Stators did not have to be 'easily removable'.
- b) Motors homologated starting 2012 were required to have:- If the stator cannot be easily removed from the assembled motor, then the Can/Casing must have slots or holes that will allow measurement of the stator length and slots or holes to allow visual appraisal of the stator laminates.
- c) Motors homologated starting 01.03.18 were required to have:- If the stator cannot be easily removed from the assembled motor, then the Can/Casing must have minimum two pairs of slots or holes, each exposing 3mm of stator ends minimum, in line with the centre-line of the stator, that will allow measurement of the stator length and slots or holes to allow visual appraisal of the stator laminates.
- d) Starting 01.03.21, any new motor submitted for homologation must have a minimum of one (1) full length slot in the motor casing, parallel to the centre-line of the stator, to allow all laminates to be viewed. The slot(s) must have length and width dimensions sufficient to allow stator length measurement using conventional measuring tools.
- e) Starting 01.01.25. Whilst the design of the Can/Casing or separate End-Caps is not restricted, these items must be of a circular design with the outer circumference unbroken in area's diametrically opposite, to allow direct measurement of the outer diameter at several points with conventional instruments.

Older motors approved under: a), b), c) retain their homologation status.

6.4 The Stator: Slot-less stators are not allowed. The stator must be continuous laminations having the same overall design and shape, being one after the other without anything in between. The laminations must be of one homogeneous material without cut-outs, holes or hollow sections other than for the three slots for copper coil wires and (if needed) the three grooves or holes for the screws used to hold the entire assembly together.

If the motor design comprises of a stator assembly with separate End-Caps directly clamped flush to the stator end laminates, it is allowed for the stator laminates to have maximum three (3) slots or grooves at maximum width of 5.0mm. in the stator outer circumference, to locate the End-Caps concentric with the stator. These location slots or grooves can be incorporated in the area used for clamping screws, or in an area of the circumference separate from the grooves or holes used for clamping screws. All laminates must include any slots or grooves used. No other slots in the stator outer circumference are allowed.

(For clarification of what is allowed, see drawing in Rule 5.7 for Modified Motors, above).

Stator minimum length 19.30mm, maximum 21.00mm, measured across the metal surfaces of the laminates and not including any coatings. The faces of the end laminates of the stator must be free of any coatings or mouldings for minimum 1mm from the outer circumference to allow direct measurement across the metal faces of the stator ends (applied to any new motor range submitted from 01.03.18). The outer circumference edges of the end laminates must be complete with no material removed, to allow accurate measurement.

The thickness of the stator laminations is 0.35 +/- 0.05mm. All laminations must be of the same material.

The inside diameter of the stator must accept a 'plug gauge' of 14.50mm +0/-0.005 diameter, clearing the stator, plus its windings and the electrical collection ring at any end of the stator.

NOTE : Whilst all laminates in the stator must have the 'same overall shape/design', removal of sharp edges is allowed in the winding area on the end laminates (only) to offset damage to wire coatings. This is clarified as follows:- The top and bottom laminate in the stator stack of Brushless Motors covered by these rules may be deburred or chamfered, only on the wire winding web/leg, so long as the overall thickness of these end laminates is the same as other laminates in the stator and so long as the overall measured width of the wire winding web/leg of these end laminates is the same as other laminates in the stator. This requirement effectively restricts any deburring or chamfering to only the top and bottom laminates in the stator.

6.5 The Winding: Only three slot (phase) "Y" (star) wound stators are allowed. No delta wound stators allowed. Only circular (round) pure copper wire permitted.

No solid glue or 'filler' can be added to the wires of the final winding assembly. When the stator has been 'cut' to gain access to the wires, unwinding of the wires must be possible by normal

'hand' procedures. A small amount of lacquer added to the winding is allowed providing unwinding by hand is possible.

The electrical circuit through the windings can only be from the ends of the wires forming the designated number of turns. The three slotted stator must be wound with: -

21.5T Class:- 21.5 turns of -- 2 wires at: 0.724 mm. max. wire dia.

17.5T Class:- 17.5 turns of -- 2 wires at: 0.813 mm. max. wire dia.

13.5T Class: - 13.5 turns of -- 2 wires at: 0.724 mm. max. wire dia.

and -- 2 wires at: 0.574 mm. max. wire dia.

10.5T Class: - 10.5 turns of -- 2 wires at: 0.813 mm. max. wire dia.

and -- 2 wires at: 0.643 mm. max. wire dia.

Wire dimensions are before lacquer coating.

NOTE: The above metric wire diameter sizes are direct equivalents to the nominal AWG sizes previously shown. (Reference to AWG sizes removed for simplicity).

6.6 The Rotor: Shaft diameter must be 3.175mm where the pinion gear locates. Only one piece, two pole Neodymium bonded or sintered, or Ferrite (ceramic) magnetic rotors are permitted.

Magnet length will be 25.00 +/- 1.00mm, not including any non-magnetic balancing aids. Magnet outside diameter will be 12.20/12.51mm (min./max. with no further tolerance) for the entire length of the magnet. The shaft outside diameter where the magnet is mounted will be 7.25mm +/- 0.15mm, with this diameter extending beyond the magnet to facilitate measurement.

Starting 01.04.15 onwards, the rotor will be identified with the manufacturers name or logo and the unique part number of the rotor. This applies to all rotors in new motors or new optional rotors. Rotors approved before this date (without identification) retain approval.

Starting 01.03.21 onwards, any new motor or new optional rotor submitted for homologation must have the unique part number of the rotor etched/stamped on the external flat area of the rotor shaft (where the pinion is located). This must be the listed part number for the rotor as shown on the homologation list (multi-digit numbers can be adjusted to give the significant numbers). Rotor sizes/dimensions are not acceptable.

All Spec. Motors (21.5T, 17.5T, 13.5T, 10.5T) will be limited to ONE Optional Rotor for any New Motor submitted, starting 01.11.17. The manufacturer or UK distributor to specify the Optional Rotor. Only rotors detailed on the homologation lists can be used.

6.7 All motors must have the original manufacturer's logo or name moulded/engraved by the manufacturer into the end bell/plate. A unique marking or feature that is difficult to remove must be incorporated into the assembled motor to identify the motor is either a 21.5T, 17.5T, 13.5T or 10.5T Spec. class motor. Spec. motors introduced from 2011 onwards must have; the 'wind' # etched/engraved onto the outer surface of the motor on a part of the motor that cannot easily be separated from the stator windings. They must also be identified as Spec. class motors.

NOTE: The above rules form the basis for Brushless Spec. motors. If it is found that variations of these motors from different manufacturers give large differences in performance, then electrical tests may be adopted.

7. Rules - Zero Timing Speed Controllers ('Blinky').

Definition of a :- Zero Timing Brushless Speed Controller ('Blinky').

Only speed controllers that do not dynamically adjust the timing of the motor are permitted.

When operating in this mode, all advanced timing functions such as Boost, Turbo, etc that change the timing of the motor are disabled. The commutation sequence is limited to a "6-step" type and commutation of the Speed Control must follow the motor's hall sensor signals 1:1. Therefore no change of timing (either advance or retard) is allowed at any RPM or throttle position. When the "Blinky" mode is activated, it will be identified by a blinking LED or LED's while the ESC is armed and in neutral position.

Brushless Speed Controllers that have any programs or features that can alter the 'fixed' timing of the motor, must have these features disabled when being used at any events (or Classes) where 'Zero Timing', 'Blinky' programs are required in the rules.

Sections can reserve the right to retain a speed controller and motor after the conclusion of a meeting to measure its performance against the above criteria in a controlled environment. The

equipment, or identical new replacements, will be returned to the competitor within 5 working days. Sanctions may be taken against a competitor and/or manufacturer if a controller is found to be non-compliant.

8. Rules - 'Brushed' Motors for 1/12th Stock Car Section.

NOTE: The technical details below have been agreed for the 1/12 F2 Stock Section. The dimensions detailed are similar to those used for 'Rebuildable Stock' motors used by other Sections in past years, but some details have been amended to reflect current production.

Can length from mounting face --	53.00 mm maximum.
Can diameter --	36.02 mm maximum.
Motor type/Manufacturer Logo --	Plain silver Can engraved with; manufacturers name, type and Part Number. Manufacturer label must include Motor Type and Part Number.
Bushings --	No bearings or ballraces allowed. Only 'bushings' allowed.
Motor mounting holes --	Threaded holes on 25.0/25.4mm centres.
Timing – Brush to Can zero --	Fixed timing. Brush spring plates to have mounting pin centre between magnets.
Magnet position to Can zero --	+/- 3 deg.
Armature length (no coatings) --	21.00/22.80. Measured across metal faces of end laminates with hysol or any coatings removed.
Laminate thickness --	0.50 +/- 0.05 mm.
Number of 'Turns' --	21 Turn minimum on each pole.
Wire diameter (no coatings) --	0.710 mm. maximum with any lacquer coating removed.
Balancing --	Armature balancing allowed.
Fan --	Armature 'fan' allowed.