Power 10 Brushless Outrunner Instructions

Thank you for purchasing the E-flite Power 10 Brushless Outrunner motor. The Power 10 is designed to deliver clean and quiet power for 10-size sport and scale airplanes weighing 32- to 48-ounces (910- to 1360-grams), 3D airplanes 28- to 36-ounces (790- to 1020-grams), or models requiring up to 375 watts of power. It's an especially good match for the E-flite Brio 10 for high speed F3A precision or artistic aerobatics.

Power 10 Brushless Outrunner Features:
• Equivalent to a 10-size glow engine for 32- to 48-ounce (910- to 1360-gram) airplanes
• Ideal for 3D airplanes 28- to 36-ounces (790- to 1020-gram)
• Ideal for models requiring up to 375 watts of power
• High torque, direct drive alternative to inrunner brushless motors
• Includes mount, prop adapters, and mounting hardware
• Quiet, lightweight operation
• External rotor design, 5mm shaft can easily be reversed for alternative motor installations
• High quality construction with ball bearings and hardened steel shaft
• Slotted 12-pole outrunner design

Power 10 Specifications
Diameter: 35mm (1.4 in)
Case Length: 42mm (1.6 in)
Weight: 122g (4.3 oz)
Shaft Diameter: 5mm (.2 in)

EFLM4010A
Kv: 1100 (rpms per volt)
Io: 2.1A @ 10V (no load current)
Ri: .043 ohms (resistance)
Continuous Current: 30A*
Max Burst Current: 38A*
Watts: up to 375
Cells: 6-10 Ni-MH/Ni-Cd or 2-3S Li-Po
Recommended Props: 10x5 to 12x6 Electric
Brushless ESC: 35-40 Amp

* Maximum Operating Temperature: 220 degrees Fahrenheit
* Adequate cooling is required for all motor operation at maximum current levels.
* Maximum Burst Current duration is 15 seconds. Adequate time between maximum burst intervals is required for proper cooling and to avoid overheating the motor.
* Maximum Burst Current rating is for 3D and limited motor run flights. Lack of proper throttle management may result in damage to the motor since excessive use of burst current may overheat the motor.

Determine a Model's Power Requirements:
1. Power can be measured in watts. For example: 1 horsepower = 746 watts
2. You determine watts by multiplying 'volts' times 'amps'. Example: 10 volts x 10 amps = 100 watts

Volts x Amps = Watts

3. You can determine the power requirements of a model based on the 'Input Watts Per Pound' guidelines found below, using the flying weight of the model (with battery):

- 50-70 watts per pound; Minimum level of power for decent performance, good for lightly loaded slow flyer and park flyer models
- 70-90 watts per pound; Trainer and slow flying scale models
- 90-110 watts per pound; Sport aerobatic and fast flying scale models
- 110-130 watts per pound; Advanced aerobatic and high-speed models
- 130-150 watts per pound; Lightly loaded 3D models and ducted fans
- 150-200+ watts per pound; Unlimited performance 3D and aerobatic models

NOTE: These guidelines were developed based upon the typical parameters of our E-flite motors. These guidelines may vary depending on other motors and factors such as efficiency and prop size.

4. Determine the Input Watts Per Pound required to achieve the desired level of performance:

Model: E-flite Brio 10 ARF
Estimated Flying Weight w/Battery: 2.1 lbs
Desired Level of Performance: 150-200+ watts per pound; Unlimited performance 3D and aerobatics

2.1 lbs x 150 watts per pound = 315 Input Watts of total power (minimum) required to achieve the desired performance

5. Determine a suitable motor based on the model's power requirements. The tips below can help you determine the power capabilities of a particular motor and if it can provide the power your model requires for the desired level of performance:

- Most manufacturers will rate their motors for a range of cell counts, continuous current and maximum burst current.
- In most cases, the input power a motor is capable of handling can be determined by:

Average Voltage (depending on cell count) x Continuous Current = Continuous Input Watts

Average Voltage (depending on cell count) x Max Burst Current = Burst Input Watts

HINT: The typical average voltage under load of a Ni-Cd/Ni-MH cell is 1.0 volt. The typical average voltage under load of a Li-Po cell is 3.3 volts. This means the typical average voltage under load of a 10 cell Ni-MH pack is approximately 10 volts and a 3 cell Li-Po pack is approximately 9.9 volts. Due to variations in the performance of a given battery, the average voltage under load may be higher or lower. These however are good starting points for initial calculations.

Model: E-flite Brio 10 ARF
Estimated Flying Weight w/Battery: 2.1 lbs
Total Input Watts Required for Desired Performance: 315 (minimum)

Motor: Power 10
Max Continuous Current: 30A*
Max Burst Current: 38A*
Cells (Li-Po): 3

3 Cells, Continuous Power Capability: 9.9 Volts (3 x 3.3) x 30 Amps = 297 Watts
3 Cells, Max Burst Power Capability: 9.9 Volts (3 x 3.3) x 38 Amps = 376 Watts

Per this example, the Power 10 motor (when using a 3S Li-Po pack) can handle up to 376 watts of input power, readily capable of powering the Brio 10 ARF with the desired level of performance (requiring 315 watts minimum). You must however be sure that the battery chosen for power can adequately supply the current requirements of the system for the required performance.

Battery Choices:
We recommend Thunder Power Li-Po batteries for the best performance and lowest weight (in some cases Ni-MH 1800-2200mAh high-discharge packs also make good alternatives at the expense of weight and lower capacity). Some examples of the packs we recommend for use with the Power 10 motor can be found below:

THP21002SPL	2100mAh 2-Cell 7.4V LIPO,16GA
THP21003SPL	2100mAh 3-Cell 11.1V LIPO,16GA
THP42002S2PPL	4200mAh 2-Cell 7.4V LIPO, 13GA
THP42003S2PPL	4200mAh 3-Cell 11.1V LIPO, 13GA

Examples of Airplane Setups:
Please see our web site for the most up-to-date information and airplane setup examples.

NOTE: All data measured at full throttle. Actual performance may vary depending on battery and flight conditions.

E-flite Brio 10 ARF

Option 1:
Motor: Power 10
ESC: E-flite 40A Brushless (V2) (EFLA312B)
Prop: APC 12x6E (APC12060E)
Battery: Thunder Power PRO LITE 2100mAh 11.1V 3-Cell (THP21003SPL)
Flying Weight w/Battery: 2.1 lbs

Amps	*Volts*	*Watts*	*Input Watts/Pound*	*RPM*
37.2	9.6	357	170	7800

Expect good speed and extreme vertical power for artistic aerobatics. Average duration is approximately 6-9 minutes depending on throttle management.

Option 2:
Motor: Power 10
ESC: E-flite 40A Brushless (V2) (EFLA312B)
Prop: APC 11x5.5E (APC11055E)
Battery: Thunder Power PRO LITE 2100mAh 11.1V 3-Cell (THP21003SPL)
Flying Weight w/Battery: 2.1 lbs

Amps	*Volts*	*Watts*	*Input Watts/Pound*	*RPM*
33.0	9.8	323	153	8700

Expect high speeds and strong vertical performance ideal for F3A precision and artistic aerobatics. Average duration is approximately 7-10 minutes depending on throttle management.

Accessories:
See our web site at www.E-fliteRC.com or www.horizonhobby.com for our complete line of brushless motors. We have posted a specification comparison sheet on our web site so you can compare the different motors we offer.

EFLA110	Power Meter (measures power output in amps, volts, watts, and capacity)
EFLA241	Gold Bullet Connector Set, 3.5mm (3)
EFLM1925	Prop Adapter w/ Collet, 5mm
EFLA312B	40-Amp Brushless ESC (V2)
EFLM40101	Shaft: Power 10 BL Outrunner

Reversing the Shaft:
This Outrunner motor has a shaft, which exits through the rotating part of the motor. If you want to reverse the shaft to exit through the fixed part of the motor, follow these instructions carefully for changing the shaft installation. **NOTE:** The user assumes all liability for damage that may occur.

1. Loosen the set screw on the shaft collar and remove the collar from its location against the bearing.
2. Remove the small black donut washer that rests against the bearing.
3. Loosen the two set screws in the rotating part of the motor.
4. Slide the shaft through the motor. It may be necessary to use a small hammer to lightly tap the shaft. It is very important that you do not bend the shaft in this process so use extreme caution to assure this does not happen.
5. Re-install the donut washer against the bearing. Do not skip this step.
6. Re-install the shaft collar back against the washer and bearing.

7. Retighten all setscrews making sure you line up with the flat spot on the shaft.

Replacement shafts are available separately.

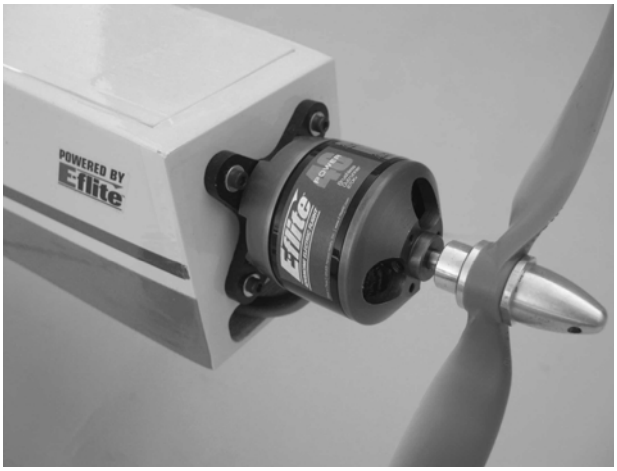
Operating Instructions:

1. This brushless motor requires the use of a sensorless brushless speed control. Failure to use the correct speed control may result in damage to the motor and/or speed control.
2. When mounting the motor, be sure the correct length of screws are used so damage to the inside of the motor will not occur. We suggest you use the mounting hardware included with your motor. **The use of long screws will damage the motor.**
3. You may connect the three motor wires directly to the controller with solder or use connectors such as gold plated brushless bullet connectors (EFLA241), which will also need to be soldered properly to your wires. The three motor wires can be connected in any order to the three output wires or output port on a sensorless brushless speed control. Be sure to use heat shrink tubing to properly insulate the wires so the wires will not short. Shorting may damage the motor and speed control.
4. If you add connectors and you no longer wish to use them, never cut the motor wires. Remove them by properly desoldering them. Shortening the motor wires is considered an improper modification of the motor and may cause the motor to fail.
5. When you connect the motor to the esc, check the rotation direction of the motor. If you find the rotation is reversed, **switching any two motor wires will reverse the direction so the motor rotates properly**.
6. Proper cooling of the motor is very important during operation. New technology has brought much higher capacity batteries with higher discharge rates, which can cause extreme motor temperatures during operation. It is the responsibility of the user to monitor the temperature and prevent overheating. Overheating of the motor is not covered under any warranty.
7. You can install the propeller on the motor shaft after you have confirmed proper rotation direction. Also consult the instruction included with your sensorless electronic speed control for proper adjustments and timing.
8. Once the battery is connected to the motor, please use extreme caution. Stay clear of the rotating propeller since spinning propellers are very dangerous as the motors produce high amounts of torque.
9. Never disassemble the motor. This will void any warranty.

Safety Precautions:

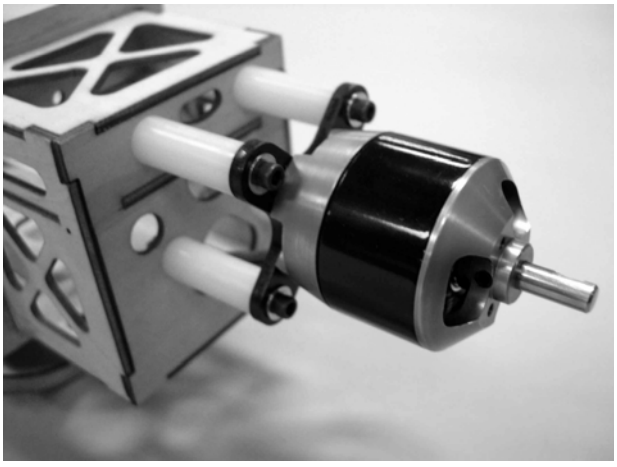
This is a sophisticated hobby product and not a toy. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this product in a safe and responsible manner could result in injury or damage to the product or other property. **This product is not intended for use by children without direct adult supervision. The Outrunner motor case is a rotating part so use extreme caution.** Please read the warning information included with your propellers for safety information related to the operation of motors with propellers. Failure to comply with these warnings and/or improper use of propellers may result in serious injury.

Installation:



NOTE: Photo shows typical installation of motor and x-mount directly to the outside of the firewall. There are other options available including mounting the motor inside the fuselage (requires reversing the shaft direction) or extending the motor further forward using aftermarket mount extensions when using cowls.

1. You can first trial fit the aluminum x-mount against the front of the firewall and use a Sharpie® to mark the locations of four holes and drill appropriate size hole to fit the blind nuts provided. Always be sure to maintain the proper thrust line and account for adequate prop/spinner clearance.
2. Attach aluminum x-mount to the outrunner motor using the four flat head (countersunk) screws provided with the motor.
3. Install four blind nuts on the inside of the firewall.
4. Attached the aluminum x-mount and motor to the outside of the firewall using the four socket head cap screws and washers.



NOTE: Photo above shows installation using nylon motor standoffs.

1. Attach the aluminum x-mount to the back of your motor with the flat head machine screws included with your motor.
2. Choose a standoff length that will allow for proper clearance of your propeller once the cowl is attached. You may want to trial fit the cowl to make this determination.
3. Insert appropriately sized socket head screws and washers into the four outside holes on the x-mount, through the standoffs, and then attached to blindnuts in the firewall.

Limited Warranty Period
Horizon Hobby, Inc. guarantees this product to be free from defects in both material and workmanship for a period of 1 year from the date of purchase.

Limited Warranty & Limits of Liability
Pursuant to this Limited Warranty, Horizon Hobby, Inc. will, at its option, (i) repair or (ii) replace, any product determined by Horizon Hobby, Inc. to be defective. **In the event of a defect, these are your exclusive remedies.**

This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of, or to any part of the Product. This warranty does not cover damage due to improper installation, operation, maintenance, or attempted repair by anyone other than an authorized Horizon Hobby, Inc. service center. This warranty is limited to the original purchaser and is not transferable. In no case shall Horizon Hobby's liability exceed the original cost of the purchased product and will not cover consequential, incidental or collateral damage. Horizon Hobby, Inc. reserves the right to inspect any and all equipment involved in a warranty claim. Repair or replacement decisions are at the sole discretion of Horizon Hobby, Inc. Further, Horizon Hobby reserves the right to change or modify this warranty without notice.

REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE CONSUMER. HORIZON HOBBY, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

As Horizon Hobby, Inc. has no control over use, setup, final assembly, modification or misuse, no liability shall be assumed nor accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability.

If you as the purchaser or user are not prepared to accept the liability associated with the use of this product, you are advised to return this product immediately in new and unused condition to the place of purchase.

Safety Precautions
This is a sophisticated hobby product and not a toy. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this product in a safe and responsible manner could result in injury or damage to the product or other property. **This product is not intended for use by children without direct adult supervision.**

The product manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or injury.

Questions, Assistance, and Repairs
Your local hobby store and/or place of purchase cannot provide warranty support or repair. Once assembly, setup or use of the product has been started, you must contact Horizon Hobby, Inc. directly. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance.

Questions or Assistance
For questions or assistance, please direct your email to productsupport@horizonhobby.com, or call 877.504.0233 toll free to speak to a service technician.

Inspection or Repairs
If your product needs to be inspected or repaired, please call for a Return Merchandise Authorization (RMA). Pack the product securely using a shipping carton. Please note that original boxes may be included, but are not designed to withstand the rigors of shipping without additional protection. Ship via a carrier that provides tracking and insurance for lost or damaged parcels, as Horizon Hobby, Inc. is not responsible for merchandise until it arrives and is accepted at our facility. Include your complete name, address, phone number where you can be reached during business days, RMA number, and a brief summary of the problem. Be sure your name, address, and RMA number are clearly written on the shipping carton.

Warranty Inspection and Repairs
To receive warranty service, you must include your original sales receipt verifying the proof-of-purchase date. Providing warranty conditions have been met, your product will be repaired or replaced free of charge. Repair or replacement decisions are at the sole discretion of Horizon Hobby.

Non-Warranty Repairs
Should your repair not be covered by warranty and the expense exceeds 50% of the retail purchase cost, you will be provided with an estimate advising you of your options. You will be billed for any return freight for non-warranty repairs. Please advise us of your preferred method of payment. Horizon Hobby accepts money orders and cashiers checks, as well as Visa, MasterCard, American Express, and Discover cards. If you choose to pay by credit card, please include your credit card number and expiration date. Any repair left unpaid or unclaimed after 90 days will be considered abandoned and will be disposed of accordingly.

Motors requiring inspection or repair should be shipped to the following address (freight prepaid):

Horizon Service Center
4105 Fieldstone Road
Champaign, Illinois 61822

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