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PowerBox iESC 125.8 Speed Controller

Telemetry enabled hi-end ESC

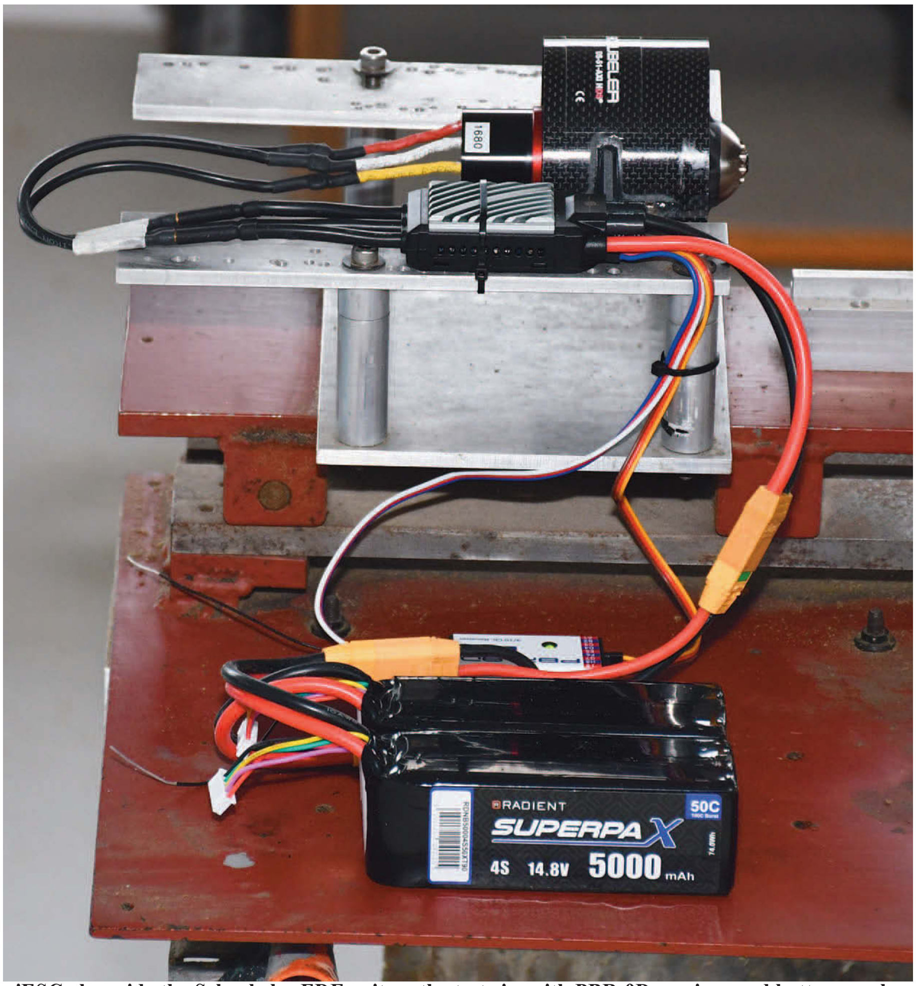
The full iESC 125.8 package, complete with leads and manual

As I am currently building an RBC Kits Fouga Magister for EDF (Electric Ducted Fan) power I was in need of a high-quality ESC (Electronic Speed Controller) to work together with the Schuebeler EDF unit, and with perfect timing PowerBox had recently released a pair of new ESC's, one of which, the iESC 125.8, looked ideal for the model.

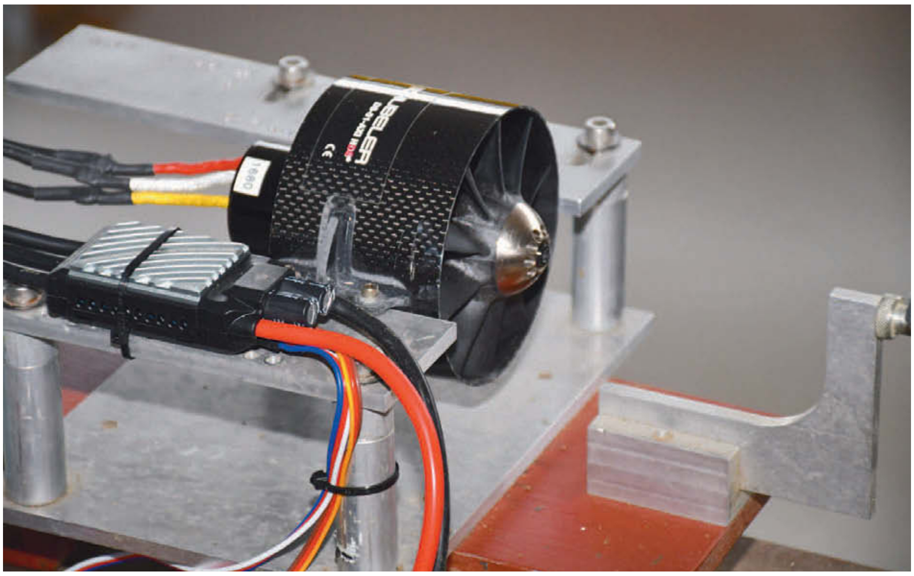
This ESC is quite compact, being 88 x 38 x 24mm in size and weighing 112 grams, being suitable for 3 to 8 cell Li-Po packs, and can cope with constant loads of up to 125 Amps, with a peak of 135 Amps. It also has a Bec (Battery Eliminator Circuit) that can be set to 6.0, 7.4 or 8.4 volts, with a maximum current of 8 Amps. The second of the new ESC's is the iESC 65.8, which as the name suggests can cope with constant loads of 65 Amps – 75 Amps peak, being suitable for 3 to 6 cell packs. It is 60 x 36 x 20mm in size and weighs 65 grams.

Of course, being a PowerBox product the iESC comes with full telemetry functionality for PowerBox, Jeti and Futaba radio systems, which includes:

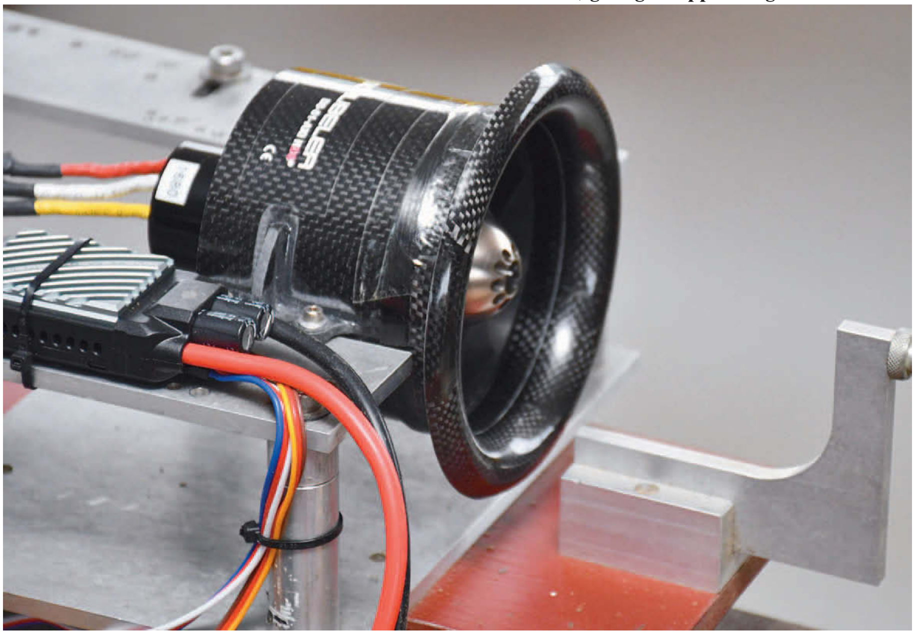
- Battery voltage
- Current
- Consumed capacity



iESC alongside the Schuebeler EDF unit on the test rig, with PBR-9D receiver and battery packs



First test was carried out with the bare Schuebeler unit, giving disappointing results



Testing with the intake moulding fitted made a huge difference to the performance of the system

- RPM (Motor pole numbers can be set)
- iESC temperature
- Status (Only when using a PowerBox radio)

When the iESC is being used with PowerBox or Jeti radios it is possible to directly set the various operating parameters, these being:

- Brake power
- Motor timing
- Direction
- Freewheel
- Cell count
- Power-off voltage
- Power-off type
- BEC output
- Acceleration
- Start-up power
- Flight mode
- Pole pairs
- Gear ratio (for geared drive systems)

For those using other radio brands PowerBox offer their low cost Program Card to make any changes required.

As well as all of this, the iESC also has in-built protection for itself, offering the following:

- Abnormal input voltage warning – the LED flashes if the input voltage is outside the operational range.
- Start-up guard
- Overheating guard
- Loss of throttle signal
- Overload guard
- Low voltage
- Excess current guard

I was keen to test both the iESC and the Schuebeler DS-51-AXI HDS/HET700-68-1680kV fan unit fully before installing them in the model, so I fitted the fan unit to the test rig I normally use for turbine testing, and connected up the iESC, powering the combination with two 4 cell 5000mAh 50C Radient Li-Po battery packs connected in series to make up the 8 cells required.

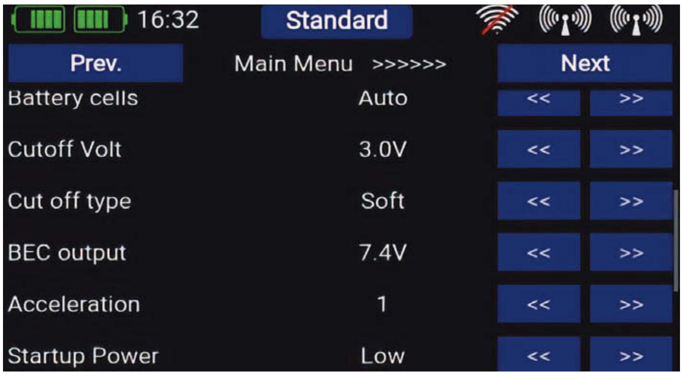
As might be expected it took just a few seconds to connect up the iESC to the EDF system and the PBR-9D receiver I was using together with my PowerBox Atom transmitter, the two input leads plugging into the throttle channel and the P^{2}BUS sockets. With the batteries connected up I was able to add the various widgets on the Atom screen to display status, voltage, current, rpm, throttle stick position, FET temperature and consumed capacity of the flight battery.

I then went into the main menu, where as already mentioned, it was possible to see and make changes to all of the various parameters, this being a very useful option. In fact there was little that needed adjustment, just the motor timing being adjusted and the motor pole number being set, this to enable the correct rpm figure to be read.

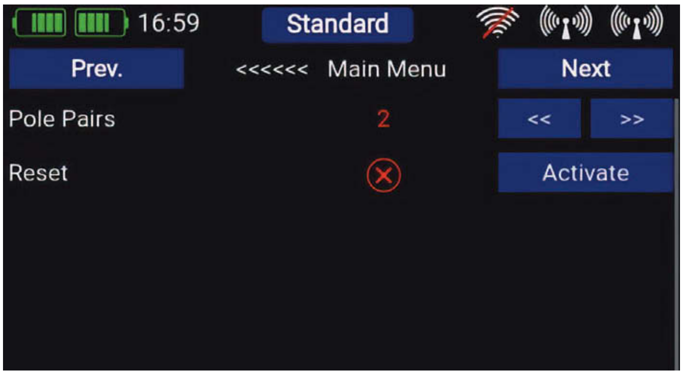
As I expected, operation was seamless from the start, plugging everything in resulted in the expected number of beeps from the ESC, and the telemetry data appeared on the Atom screen. Running the EDF system up on the test rig proved very interesting – the iESC performed perfectly, giving smooth control throughout the rpm range, and instant throttle response. Initially I ran the fan unit without the moulded intake duct, and was rather disappointed with the results, with the thrust being measured at only 28.0 Newtons (2.85Kg/6.29Lb), well below the expected thrust of over 40 Newtons. Current measured by the iESC was also a little lower than I had expected, at 91 Amps, with an rpm figure of 41,500.

I then fitted the air intake duct provided by Schuebeler – what an amazing difference! The first thing I noticed was a huge reduction in noise level, as well as a change in the sound itself, the system now sounding similar to a (very quiet) turbine, but the increase in power was striking. Full power current had increased to 97 Amps, with the rpm being a fraction down at 41,000, but thrust had reached no less than 44.8 Newtons (4.57Kg/10.07Lb)! I had always known that a smooth airflow path into an EDF unit was important, but this test showed just how vital this is – I will ensure as smooth a transition as possible between the intake ducting of the Fouga Magister and the EDF unit when it is installed. With this level of thrust, albeit that the bifurcated ducting will result in a degree of reduction, the Fouga should have plenty of power.

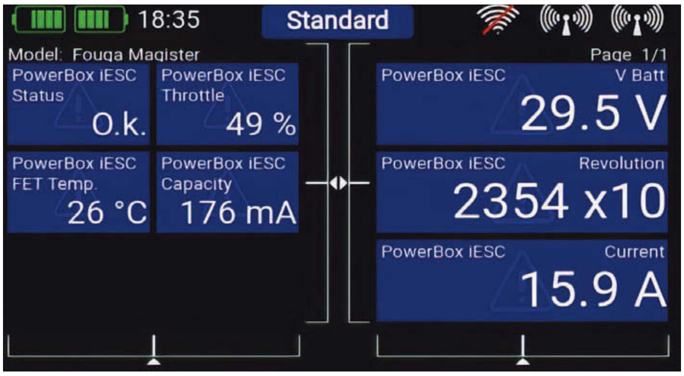
First of the three parameter setting screens on the Atom transmitter



Parameter screen 2



Third and final parameter screen



Main screen of the Atom with all the available telemetry information visible

I was very pleased with the outcome of my testing, the iESC worked perfectly, providing smooth control throughout the rpm range, whilst the data provided from the iESC telemetry will be very useful, allowing the current and capacity used to be monitored, both when checking the model before flight, and when it is actually airborne. With the maximum measured current so far being some 97 Amps, the iESC is operating well within its limit of 125 Amps, and the 8 Amp BEC output will be plenty for the on-board radio equipment, eliminating the need for a separate Rx battery, with its associated weight. Overall I am very pleased that I chose such a high quality and feature packed ESC for the Fouga Magister, and look forward to getting in installed into the airframe, together with the Schuebeler fan system.

A close-up of the iESC showing the nicely machined heatsink and filter capacitors

Underside of the iESC, where the connection for the (blue, red and white) telemetry lead and main throttle channel lead can be seen

Colin Straus

WEBSITE
www.powerbox-systems.com