the first is the current, which the ESC will take continuously, and the second is the short term current allowed normally for no more than 10-30 seconds. So in the example, you could run at 18A (18 Amps) forever and use up to 22A for short periods, e.g. at takeoff. We recommend when selecting a speed controller allowing 20% margin so if you have a motor that draws 15 amps, I would select an ESC, which would have a minimum rating of 18 amps, based on the following simple calculation: 15 amps x 1.20 (20%) = 18 amps.

The other main ESC rating is the maximum voltage, more commonly expressed as a number of cells both Lithium Polymer and NiMH/NiCad. This is pretty straightforward. If you try to use the ESC with more cells it will break. It's also worth noting that many speed controls also give a minimum voltage or number of cells.

ESC features BEC

BEC stands for Battery Elimination Circuit. It is a facility, which allows the radio receiver and servos to run off the main motor battery (within certain conditions) so that you do not need a separate receiver battery. There are certain limits associated with BEC circuits that you need to keep in mind. BEC works by reducing the motor battery voltage down to the 5V needed by the receiver. Doing this creates heat. Because of this it will only work with a main battery of up to some specified number of cells, often 10 cells (or 12V), and also with a specified load often 1 or 1.5A. The load is sometimes expressed as a number of servos and may reduce as the number of main battery cells goes up. For example, it may allow three servos up to two Li-Poly cells and only two servos for a three-cell Li-Poly pack, with no BEC over four Li-Poly cells.

Motor cut off

This feature is always associated with BEC. It cuts power to the motor before the battery is completely exhausted so that you still have power to the radio to get to a safe landing. Motor cut-off voltages nowadays are programmed into the speed controller and can auto detect the number of cells used once a power source is initially plugged in.

Brake

Just as it sounds. When the throttle is at zero it applies a braking effort to the motor to stop it turning. This is to allow folding propellers to fold neatly rather than wind milling around creating lots of drag. Most are used on gliders and old-timers, which typically use the motor to get them up and then thermal around, sometimes for ages.

Opto-isolation (OPTO)

This feature electrically isolates the signal from the radio throttle channel from the ESC. Doing this can dramatically reduce the level of radio interference, which can be created especially with very high currents. You cannot have both opto-isolation and BEC working at once in an ESC, though quite a few allow you to select at installation which of the two features you want to use.

PWM (Pulse Width Modulation/High rate control)

The control of motor speed is obtained by switching the power to the motor on and off in various ratios, e.g. maximum throttle is permanently on, half throttle is on half time, off half time, etc. This switching on and off is done many times a second. The speed at which the switching takes place has a large effect on overall efficiency. Early speed controls used what is known as "frame rate" switching, which means that they switched approximately 50 times a second, the same rate frames of information are delivered over the radio. Most modern ESCs switch at a much higher rate, which makes them much more efficient, i.e. they lose less power as heat in the controller. Switching rates around 3000 Hz (times a second) are about optimum. Anywhere between 1000 Hz and 5000 Hz is acceptable.

Timing Mode

Timing mode is similar to PWM and controls the on/off switching in the motor. There are two types:

- Soft timing: for two-, four-, six-pole motors (Mini AC, Kontronik, Hacker).
- Hard timing; six or more pole motors (Jeti Phasor, Mega, Plettenberg).

Hard timing increases both the motor revolutions and the current (up to 20%) with the same propeller and battery pack when compared to soft timing. Hard timing is more suitable for fast flying models.

Always use soft timing initially and after a few flights if the temperature of the batteries, speed controller, and motor are below 50° Celsius, then it is possible to test the system using the hard timing mode. Note: Hard timing should not be used with any two-pole motors (Mini AC, Kontronik, Hacker).

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