

HobbyWing Platinum V4 ESCs Speed-governing Function

1 Explanation for ESC Speed-governing

Establish the “Motor RPM-Throttle Amount Curve” via the speed standardization, and then set the throttle amount to some fixed value on the transmitter, in that condition, the motor will output the RPM corresponds to the throttle amount and keep rotating at that speed.

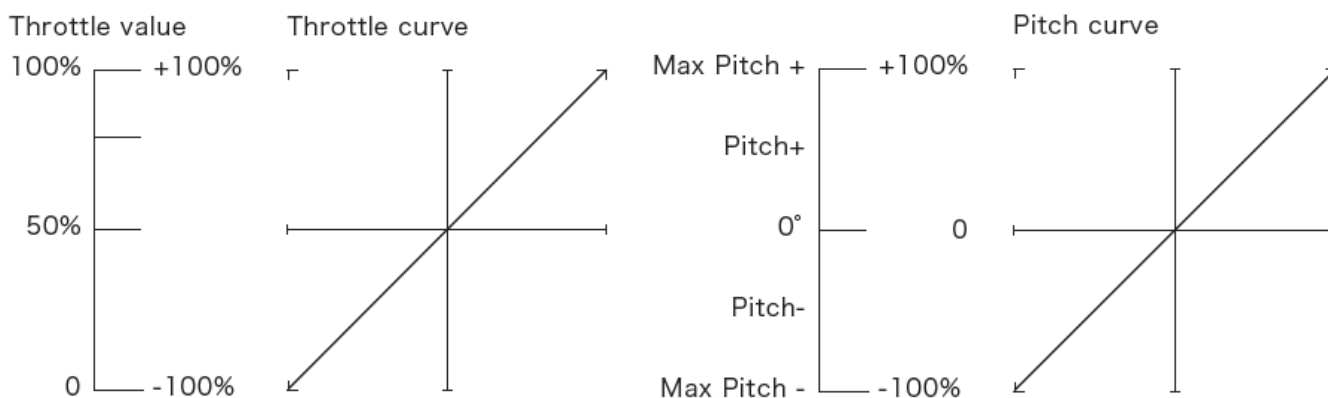
- In the “Helicopter (Elf Governor)” mode, the ESC won’t save the “Motor RPM-Throttle” curve after it’s disconnected from the battery, so every time the ESC is connected to the battery, it will standardize the speed, otherwise you cannot use the speed-governing function normally. In this mode, due to the differences like batteries’ different discharge capacity, the standardized RPM is a little different every time. In consequence, at the same throttle amount, the RPM may be a bit different when using different batteries, but this won’t affect the speed-governing effect.
- In the “Helicopter (Store Governor)” mode, the ESC will save the “Motor RPM-Throttle” curve after the speed standardization. So after adjusting to this mode from any other mode, you need to standardize the speed when the ESC is connected to the battery for the first time and you needn’t standardize the speed again after disconnecting the ESC from the battery first and then connecting it to the battery again. If adjusting to any other mode from this mode and saving the “Motor RPM-Throttle” curve, and then adjusting back to this mode, the “Motor RPM-Throttle” curve saved by the ESC will be cleared, and you need to standardize the speed once again. If your ESC remains in this mode in future, then it will always carry out its operation as per the saved “Motor RPM-Throttle” curve. When standardize the speed for the first time, we recommend using a battery in good condition. After the RPM standardization, change another battery with the same number of cells to fly your aircraft. At the same throttle amount, the RPM should be consistent with the RPM of the first flight.

2 RPM Standardization

1) Theory of RPM Standardization

During the RPM standardization, the ESC will establish a “Motor RPM-Throttle” curve by itself based on the actual battery voltage and the actual KV rating of the motor. Therefore, you need to standardize the speed with a fully charged battery, and ensure the main blade pitch is 0° (in order to make the helicopter not take off).

In general, people use the default “Throttle Curve & Pitch Curve” of the transmitter (as shown below) when they standardize the speed.



Attention: Please ensure the main blade pitch is 0° and the throttle amount is above 40% (we recommend using 50%) when standardizing the speed.

2) Procedures of RPM Standardization

- We recommend using the default “Throttle Curve & Pitch Curve”. (If you don’t want to use the default setting, then please ensure the throttle amount is 50% and the main blade pitch is 0° when the motor rotates.)
- Turn on the transmitter, move the throttle stick to the bottom position and then wait for the ESC completing the self detection.
- If you’ve set the “throttle cut” function, please lock the “throttle cut”, and then move the throttle stick to the 50% position and then unlock the “throttle cut”. If there is no “throttle cut”, then you can move the throttle stick to the 50% position directly.
- The ESC drives the motor to rotate, the main blades start to accelerate slowly (because the main blade pitch is 0° , so the helicopter won’t take off, but you still needs to be careful), you need to wait for the acceleration completing and the speed getting stable, and then lock the “throttle cut” or move the throttle stick to the bottom position.

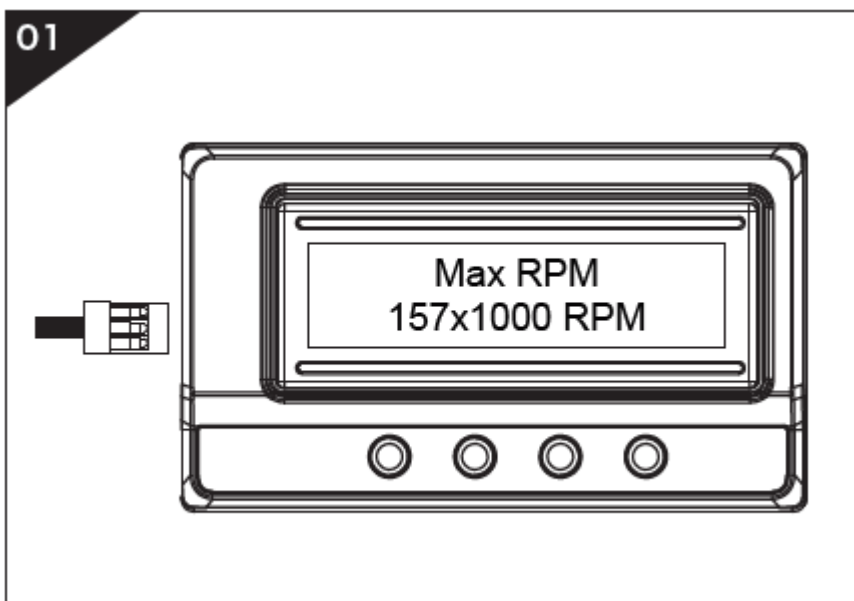
- The ESC will stop driving the motor, the main blades start to slow down and then stop rotating.
- The RPM standardization completes.

Attention: Please calibrate the throttle range before the RPM standardization. There will be no need if you've carried out the ESC/Radio Calibration when the first time you used this ESC or you didn't restore the settings to factory defaults after the calibration (changing the transmitter & receiver is an exception).

3 How to Set the Speed-governing Function

Attention:

- The best throttle amount (set in the Helicopter "Store Governor" mode) of the ESC ranges from 70% to 90%, so please try to set the throttle amount (set in the Helicopter "Store Governor" mode) within this range. A low throttle amount (set in the Helicopter "Store Governor" mode) will make the ESC always function inefficiently; while a high throttle amount (set in the Helicopter "Store Governor" mode) will leave the ESC a very small compensation space, then compensation insufficiency issue may happen and cause (speed decrease) problem when the load is high. In that case, we recommend changing the motor or drive gear ratio (you need to re-standardize the speed after you change the motor or drive gear ratio).
 - In the "Helicopter (Store Governor)" mode, if fly your aircraft with a low performance battery after standardizing the speed with a high performance battery may cause damage to the low performance battery.
 - In "Helicopter (Store Governor)" mode, different battery packs can bring the same stable RPM only if they have the same cell count. This won't change even when you change the battery pack. However, battery packs with different cell count don't have the same effect. For instance, in "Helicopter (Store Governor)" mode, you can't use a 4S to calibrate the motor RPM and then use a 6S to drive the motor, hoping it can run at the same RPM.
 - You can decide the control feel via adjusting Governor Parameter P/I. In "Helicopter (Store Governor) or Helicopter (Elf Governor)" mode, connect your ESC to a smart phone or PC, then you can check the "throttle VS speed" chart.
1. In "Helicopter (Store Governor)" mode, you can check the standardized speed (Max. RPM) and needn't standardize the speed every time when the ESC is connected to the battery as in the "Helicopter (Elf Governor)" mode, so it's more convenient. We recommend using this mode in the condition that you're using fixed motor, drive gear ratio and battery (with same cell count). In this mode, only if the drive gear ratio is accurate, the main blades' RPM \ corresponds to the throttle amount (set in the Helicopter "Store Governor" mode) you will get will be accurate as well. About how to "set the speed-governing function" in this mode, let's take an example .
- In "Helicopter (Store Governor)" mode, connect the ESC to the LCD program box or WIFI Express module when the RPM standardization completes, and then find the record (as shown in Figure 1) as per the instruction about the " data checking" process.

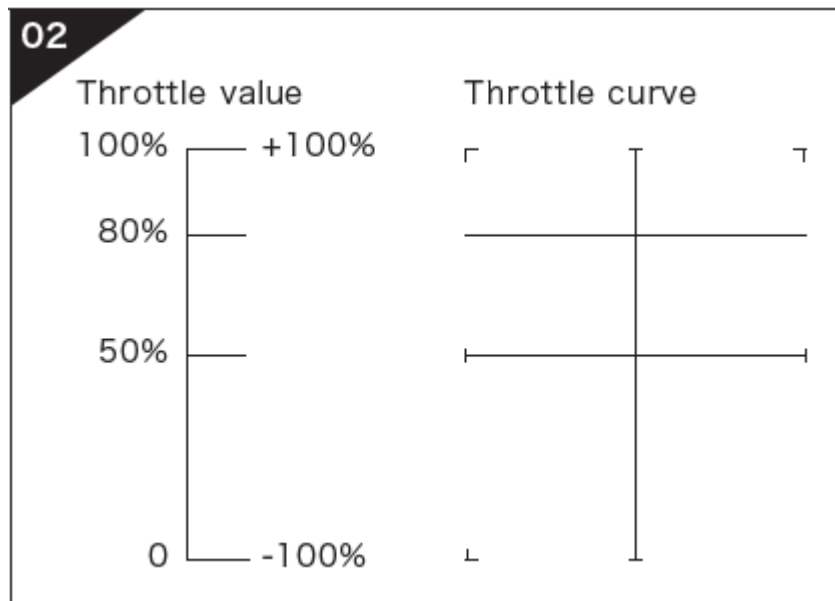


The value shown in the image is just an example, please take the value actually displayed on your LCD program box as standard. This value is the max. electrical RPM the motor can reach at the 100% throttle.

- Take a helicopter with single reduction gear unit as an example, with the motor poles is 10, the motor drive gear is 13T and the main drive gear is 120T (that the drive gear ratio is 9.3), then you can get the main blades' RPM at the 100% throttle.

Formula: Main Blades` RPM (at the 100% throttle)=Max. RPM ÷ (Motor Poles ÷ 2) ÷ Drive Gear Ratio

The Main Blades` RPM (at the 100% throttle) in the example is: $157 \times 1000 \div (10 \div 2) \div (120 \div 13) = 3400$ RPM. If the Main Blades` RPM needs to remain at 2700 RPM during the 3D flight process, then you need to set the throttle amount (set in the Helicopter "Store Governor" mode) to $2700 \div 3400 = 0.8$, that is you need to set the throttle amount to 80%. At this time, you need to set the value of the 3D throttle curve (i.e. IDLE1) to 80% (as shown in Figure 2):



So next time, when you fly your helicopter, let it take off in the "Normal" mode first and then switch to the "IDLE1" mode directly, then your helicopter can start the 3D flight with 80% throttle amount (that's the standardized speed of 2700 RPM).

Notes: in general, you can set and save 2/3 sets of throttle curve IDLE settings on a high quality transmitter (and you need to adjust the main blade pitch of each set of IDLE setting as per the actual demand), and switch between these settings during the flight and have the different throttle amount (set in the Helicopter "Store Governor" mode) to meet the different RPM demands (i.e. when setting IDLE1 to 70%, IDLE2 to 80%, IDLE3 to 90% in the way as explained earlier, then you will have three different throttle amounts (set in the Helicopter "Store Governor" mode) to meet different flight demands.

2. In the "Helicopter (Elf Governor)" mode, you are not allowed to check the Max. RPM, so you need to set the transmitter in advance and check the main blades` RPM with the help of some external device (like RPM viewer) and then decide the throttle amount you need to set. Here you can calculate the throttle amount roughly. For example, if the KV rating of the motor is 480KV, the battery is a 12S LiPo, the motor drive gear is 13T and the main drive gear is 110T, then the main blades` RPM is: $KV \text{ Rating} \times \text{Battery Voltage} \div \text{Drive Gear Ratio}$ ($480 \times 12 \times 4.2 \div 13 \div 110 \approx 2850$). So if you want your motor to rotate at the speed of 2150 RPM, then the throttle amount is: $2150 \div 2850 \approx 0.75$ (that is 75%), and then you adjust it accordingly as per your preference or the data you read on the RPM viewer.