2.5 正常开机过程

打开遥控器，将油门摇杆打至最低点

↓

将系统接上电池。1秒后马达发出一声长鸣音“哔----”，电调准备就绪

图 2-4 接线示意图

3. 常见故障

故障现象	可能原因	解决方法
上电后马达无法启动，发出“哔、哔、哔……”急促单音。	· 油门未归零。 · 油门行程设置过小。	· 若油门未归零，将油门摇杆置于最低位置。 · 若油门行程设置过小，重新设置油门行程。
上电后马达无法启动，发出“哔-、哔-、哔- ……”提示音（每声间隔时间为1s）。	接收机油门通道无油门信号输出。	检查遥控器与接收机配合是否正常。并检查油门控制通道接线是否正常。
上电后马达无法启动，发出“哔哔、哔哔哔、哔哔哔哔”循环鸣叫。	油门通道“正/反”向错误。	参考遥控器说明书，调整油门通道正反向设置。

TOMCAT MOTORS RC HOBBY CO., LTD

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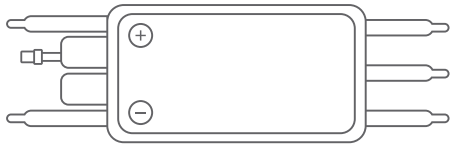
TOMCAT

SKYCLAW 系列

多旋翼飞行器无刷电子调速器

使用说明书

User Manual of Multi-Rotor Brushless Electronic Speed Controller



2. 使用向导

2.1 接线

电调与马达、接收机、电池等连接组成无刷动力系统。如图2-1所示。

· 电调的输入线与电池组连接。

· 电调的输出线与马达连接。

· 电调的信号线与接收机的油门通道连接。

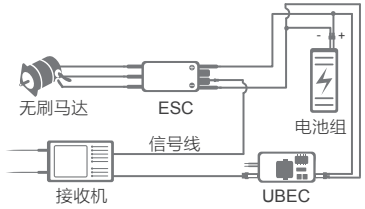


图 2-1 接线示意图

Skyclaw 电调无内置 BEC，需使用外置的 UBEC。将 UBEC 的输入端与电池组连接，输出端与接收机的一个空闲通道连接。

2.2 修改油门模式

⚠ **注意**：在飞行系统上电及飞行过程中，请勿修改油门模式。

Skyclaw电调支持PPM油门模式和OneShot125油门模式。

▲ 感谢您购买本产品。

无刷动力系统功率强大，错误的使用可能造成人身伤害和设备损坏。强烈建议您在使用设备前仔细阅读本说明书，并严格遵守规定的操作程序。我们不承担因使用本产品或擅自对产品进行改造所引起的任何责任，包括但不限于对附带损失或间接损失的赔偿责任。

1. 产品介绍

1.1 产品特点

· 主控芯片采用运行频率高达 50MHz 的 MCU，运算速度更快，大幅提升了油门的响应速度。

· 可编程项仅保留进角设定项，使用非常简单。

· 支持 PPM 油门模式（油门信号为 1100μs-1940μs）和 OneShot125 油门模式（油门信号为 125μs-250μs）。

· PPM 油门模式下支持刷新频率高达 500Hz 的油门信号，兼容各种飞控。

· 油门信号线采用双绞线，有效降低了信号在铜线内传输所产生的串扰，飞行更稳定。

· 采用专用功率管驱动芯片，驱动效率高且可靠性强。

· 当飞控也支持OneShot125功能时，才能将油门模式修改为OneShot125油门模式（需电调和飞控同时支持）。

· 仅在PPM油门模式下可进行油门行程校准和进角设定。

Skyclaw电调接入飞行系统后，系统上电时将自动检测输入的油门信号类别，并执行相应的油门模式。如需修改油门模式，先在飞控上修改油门模式，然后断开系统电源并重新上电。

2.3 校准油门行程

首次使用Skyclaw电调或更换遥控器后，需进行油门行程校准（如图2-2所示）。

⚠ **注意**：进行油门行程校准前，请卸下螺旋桨，以免发生意外。

打开遥控器，将油门摇杆推至最高点

↓

接通接收机电源

↓

遥控器与接收机正常通信后，接通电调电源

↓

电调上电后，马达按以下顺序循环鸣叫：

“哔-哔-”	油门行程校准
“哔-哔-哔-”	中进角
“哔-哔-哔-哔-”	高进角

↓

听到“哔-哔-”提示音后，3秒内将油门摇杆打至最低点，完成油门行程校准

图 2-2 校准油门行程

1.2 可编程项说明

Skyclaw电调仅在PPM油门模式下能够进行可编程项的设定。可编程项仅保留进角。进角的取值范围：高、中。默认值：中。

1.3 产品规格

表 1-1 产品规格

型号	持续电流	瞬时电流(10秒)	BEC	锂电节数	重量（g）	尺寸(长*宽*高，mm)	典型应用
Skyclaw 20A	20A	30A	无	3-4S	14	52.4x21.5x7	330/450级多旋翼
Skyclaw 40A	40A	60A	无	2-6S	26	68x25x8.7	550/650级多旋翼

1.4 保护功能说明

· 启动保护：推动油门启动后，若 2 秒内未能正常启动马达，电调将关闭动力输出。需将油门摇杆再次置于最低点才能重新启动马达。出现这种情况的原因有：电调的输出线与马达的连线接触不良或有断开、螺旋桨被其他物体阻挡等。

· 油门信号丢失保护：当检测到油门遥控信号持续丢失 0.25 秒以上时，立即关闭电调输出，以免因螺旋桨继续高速转动而造成更大的损耗。信号恢复后，立即恢复电调输出。

2.4 设置进角

进角的取值范围：中、高。默认值：中。

· 中进角：适用于大多数马达，兼容性更强。可让动力系统效率更高、发热量更小。

· 高进角：当电调驱动盘式马达出现异常或为了达到更高马达转速时，可使用高进角。但使用高进角时发热量较大。

打开遥控器，将油门摇杆推至最高点

↓

接通接收机电源

↓

遥控器与接收机正常通信后，接通电调电源

↓

电调上电后，马达按以下顺序循环鸣叫：

“哔-哔-”	油门行程校准
“哔-哔-哔-”	中进角
“哔-哔-哔-哔-”	高进角

↓

· 修改为中进角：听到“哔-哔-哔-”提示音后，3秒内将油门摇杆打至最低点

· 修改为高进角：听到“哔-哔-哔-哔-”提示音后，3秒内将油门摇杆打至最低点

图 2-3 设置进角

⚠ **注意**：改变进角后，请先在地面进行测试，测试结果显示正常后再飞行。

Thank you for purchasing this Detrum product. Brushless power system for RC model can be very dangerous. Any improper use may cause personal injury and equipment damage. Please read this manual carefully before use, and strictly comply with the operating procedures in the manual. We assume no liability for personal injury, property damage or consequential damages resulting from use of the product or unauthorized alteration of the product.

1. Product Introductions

1.1 Features

· Adopt high-frequency MCU (up to 50MHz) as the main control chip, the computing speed of the ESC is faster and the response speed of the throttle is dramatically improved.
· The ESCs only have one programmable item (**Timing**), it is very simple to use.
· The ESCs are compatible with PPM signal-receiving mode (the throttle signals range from 1100μs to 1940μs) and OneShot125 signal-receiving mode ((the throttle signals range from 125μs to 250μs).
· In PPM signal-receiving mode, the frequency of the throttle signal supported by the ESCs is up to 500Hz and compatible with various flight controllers.
· The twisted-pair design of the throttle signal cable effectively reduces the crosstalk produced in signal transmission and makes the flight more stable.
· By using specialized power tube to driver the chip, the ESCs have high efficiency and strong reliability.

1.2 Programmable Items

Users can set the program items only on PPM signal-receiving mode. The Skyclaw brushless ESCs only have one programmable item (**Timing**). Values of **Timing**: **High** and **Middle**. The default is **Middle**.

1.3 Protection Functions

· Start-up protection: If the motor fails to start within 2 seconds while pushing the throttle stick upward, the ESC will cut off the output power. You need to put the throttle stick to the lowest position again and then restart the motor. It happens in the following situations: poor connection or disconnections between the ESC and the motor, the propellers are blocked, etc.
· Throttle signal loss protection: If the throttle signal is lost for over 0.25 second, the ESC will cut off the output immediately to avoid greater losses caused by the high-speed rotation of the propeller. The ESC will recover the output immediately after normal signals are received.

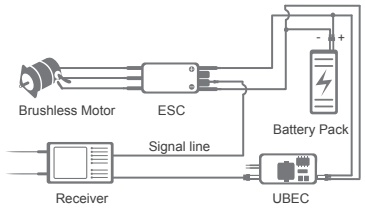
1.4 Specifications

Model	Cont. Current	Burst Current (10s)	BEC	Li-Po	Weight (g)	Size L*W*H (unit: mm)	Appli-cations
Skyclaw 20A	20A	30A	No	3-4 S	14	52.4x21.5 x7	330/450 Class multi-rotors
Skyclaw 40A	40A	60A	No	2-6 S	26	68x25 x8.7	550/650 Class multi-rotors

2. Operation Instructions

2.1 Wiring

The ESC is connected with motor, receiver, and battery pack to form a brushless power system, as shown in the figure.
· The input lines of the ESC are connected to the battery pack.
· The output lines of the ESC are connected to the motor.
· The signal lines of the ESC are connected to the throttle channel of the receiver.



Skyclaw brushless ESC is a kind of ESC without built-in battery elimination circuit (BEC), it is need to use an external UBEC (ultra BEC). The input lines of the UBEC are connected to the battery pack, the output lines of the UBEC are connected to an idle channel of the receiver.

2.2 Modify the Throttle Mode

⚠**CAUTION**: Do not change the signal-receiving mode during the powering up process and flight.

The Skyclaw brushless ESCs are compatible PPM signal-receiving mode and OneShot 25 signal-receiving mode.
· On the condition that the flight controller also supports the OneShot125 mode, users can change the signal-receiving mode of the ESC into OneShot125 (both the ESC and flight controller need to support OneShot125 mode).
· User can calibrate the throttle travel and modify the timing only on PPM signal-receiving mode.

After connecting the brushless power system and powering up, it will automatically detect the type of the input throttle signals and then execute the corresponding signal-receiving mode. To modify the signal-receiving mode, please modify the mode on the flight controller first, and disconnect the power supply, and then reconnect the power supply.

2.3 Set the Throttle Travel

Please calibrate the throttle travel when you use the ESCs first time or change another transmitter.

⚠**CAUTION**: Before calibrating the throttle travel, please remove the propellers, in order to avoid accidents.

Turn on the transmitter and move the throttle stick to the top position.
↓
Connect the receiver to the battery pack.
↓
Ensure the transmitter and receicver are well bound, and then power on the ESC.
↓
The motor will beep different tones circularly:

“beep-beep-”	throttle calibration
“beep-beep-beep”	middle Timing
“beep-beep-beep-beep-”	high Timing

↓
Move the throttle stick to the bottom within 3 seconds after the “beep-beep-” tone.

2.4 Set the Timing

Values of **Timing**: **High** and **Middle**. The default is **Middle**.
· **Middle**: Middle Timing can be applied to most motors (stronger compatibility) and brings higher efficiency but less heat to the motors and ESCs.
· **High**: When the ESC operates abnormally in driving the disc-type motor, or in order to reach a higher motor speed, high timing can be used.

Turn on the transmitter and move the throttle stick to the top position.
↓
Connect the receiver to the battery pack.
↓
Ensure the transmitter and receicver are well bound, and then power on the ESC.
↓
The motor will beep different tones circularly:

“beep-beep-”	throttle calibration
“beep-beep-beep”	middle Timing
“beep-beep-beep-beep-”	high Timing

↓
· Change to middle timing: move the throttle stick to the bottom within 3 seconds after the “beep-beep-beep” tone.
· Change to high timing: move the throttle stick to the bottom within 3 seconds after the “beep-beep-beep-beep” tone.

⚠**CAUTION**: After changing the timing setting, please test your RC model on ground prior to flight.

2.5 Normal Start-up Procedure

Turn on the transmitter and move the throttle stick to the bottom position.
↓
Connect the battery pack to the ESC, wait for 1 second, the motor will emit a long “beep----” tone . It means the ESC is ready for working.

3. Trouble Shooting

Faults	Possible Reasons	Solutions
After power on, the motor does not work, a warning tone "beep, beep, beep…" (The motor beeps rapidly) is emitted.	· The throttle stick is not at the bottom position. · The throttle travel is too small.	· If the throttle stick is not at the bottom position, move it to the bottom. · If the throttle travel is too small, calibrate the throttle travel.
After power on, the motor does not work, a warning tone “beep-,beep-,beep-…” (Every beep has an interval of 1 second) is emitted.	No output signal from the throttle channel on the receiver.	Check whether the transmitter and receiver are well bound, and whether the throttle signal line has been properly plugged into the throttle channel on the receiver.
After power on, the motor does not work, a circular warning tone "beep beep, beep beep beep, beep beep beep beep" is emitted.	The Normal / Reverse direction of the throttle channel on the transmitter is incorrect.	Refer to the transmitter instructions and modify the Normal / Reverse direction of the throttle channel.

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