

尊敬的用户:

感谢您使用飞盈佳乐电子有限公司设计、制造的无刷马达智能动力电子调速器(ESC)。因本产品在启动使用时产生的功率强大,如错误的使用及操作可能造成人身伤害和设备损坏,我们强烈建议客户在使用本产品前仔细阅读本使用手册,严格按照操作规定使用。我们不承担因使用本产品而引起的任何责任,包括但不限于附带损失或者间接损失的赔偿责任。同时,不承担使用人擅自拆装及修改本产品引起的任何责任和因第三方产品所造成的任何责任。

我们有权不预先通知变更产品,包括外观、性能参数及使用要求;对本产品是否适合使用者特定用途不作任何保证、申明或承诺。

01 主要特性

- 采用功能强大、高性能MCU处理器,用户可以针对自身需求设置使用功能,充分体现我们产品独具优势的智能特点;
- 支持无刷电机无限制最高转速;
- 支持定速功能;
- 精心的电路设计,抗干扰性超强;
- 启动方式可设置,油门响应速度快,并具有非常平稳的调速线性,兼容固定翼飞机及直升飞机;
- 低压保护阈值可设置;
- 内置SBEC,带舵机负载功率大、功耗小;
- 具备多种保护功能:输入电压异常保护/电池低压保护/过热保护/油门信号丢失降功率保护;
- 通电安全性好:接通电源时无论遥控器油门拉杆在任何位置不会立即启动电机;
- 过温保护:电子调速器工作时温度到达100°C时功率输出会自动降低一半,低于100°C时功率输出自动恢复;
- 兼容所有遥控器操作设置和支持编程卡设置;
- 设置报警音,判断通电后工作情况;
- 本公司对此产品具备完整知识产权,产品可持续升级更新。并可根据客户的需求量身定制产品。

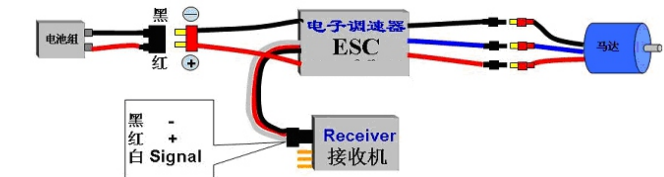
02 产品规格

型号	持续电流	瞬时电流(10S)	BEC输出	BEC模式	锂电池节数	镍氢电池节数	尺寸(mm)	重量(g)
FLY-6A	6A	8A	5V/0.5A/2A	UBEC	2-3S	5-9S	24*13*5	6.7g
FLY-6A	6A	8A	No	/	2-3S	5-9S	24*13*5	5.7g
FLY-10A	10A	12A	5V/3A-1A	SBEC/UBEC	2-3S	5-9S	32*19*5	10.1g
FLY-10A OPTO	10A	12A	No	/	2-3S	5-9S	32*19*5	9.1g
FLY-12A	12A	15A	5V/1A-2A	UBEC	2-3S	5-9S	24*18*6	9g
FLY-12A OPTO	12A	15A	No	/	2-3S	5-9S	24*18*6	8g
FLY-15A	15A	20A	5V/2A	UBEC	2-4S	5-12S	32*19*5	10.8g
FLY-15A OPTO	15A	20A	No	/	2-4S	5-12S	32*19*5	9.8g
FLY-20A	20A	25A	5.5V/3A-1A	SBEC/UBEC	2-4S	5-12S	43*26*11	34g
FLY-20A OPTO	20A	25A	No	/	2-4S	5-12S	43*26*11	32g
FLY-30A	30A	40A	5.5V/3A-1A	SBEC/UBEC	2-4S	5-12S	43*26*11	43.3g
FLY-30A OPTO	30A	40A	No	/	2-4S	5-12S	43*26*11	40.3g
FLY-40A	40A	60A	5.5V/4A	SBEC	2-5S	5-15S	35*31*17	43.8g
FLY-40A OPTO	40A	60A	No	/	2-5S	5-15S	35*31*17	40.3g
FLY-45A OPTO	45A	70A	No	/	3-8S	9-25S	54*31*14	58.5g
FLY-50A	50A	80A	5.5V/4A	SBEC	2-6S	5-18S	51*32*17	79.7g
FLY-50A OPTO	50A	80A	No	/	2-6S	5-18S	51*32*17	75.5g
FLY-60A	60A	80A	5.5V/4A	SBEC	2-6S	5-18S	55*36*17	64.7g
FLY-60A OPTO	60A	80A	No	/	2-6S	5-18S	55*36*17	60.7g
FLY-70A	70A	100A	5.5V/4A	SBEC	2-6S	5-18S	55*32*17	72.2g
FLY-70A OPTO	70A	100A	No	/	2-6S	5-18S	55*32*17	68.2g
FLY-80A	80A	100A	5.5V/4A	SBEC	2-6S	5-18S	55*32*17	75.5g
FLY-80A OPTO	80A	100A	No	/	2-6S	5-18S	55*32*17	70.5g
FLY-90A	90A	120A	5.5V/4A	SBEC	2-6S	5-18S	55*32*22	90.6g
FLY-90A OPTO	90A	120A	No	/	2-6S	5-18S	55*32*22	86.6g
FLY-100A	100A	140A	5.5V/4A	SBEC	2-6S	5-18S	55*32*22	102.9g
FLY-100A OPTO	100A	140A	No	/	2-6S	5-18S	55*32*22	98.9g
FLY-110A	110A	150A	5.5V/4A	SBEC	2-6S	5-18S	55*32*22	102.2g
FLY-110A OPTO	110A	150A	No	/	2-6S	5-18S	55*32*22	98.2g
FLY-120A	120A	150A	5.5V/4A	SBEC	2-6S	5-18S	55*32*22	103g
FLY-120A OPTO	120A	150A	No	/	2-6S	5-18S	55*32*22	99g

- 附注:
 1) 自带SBEC的电子调速器,给舵机供电是开关模式,输出电压5.5V,舵机可以带4A负载,瞬时2秒可达8A。
 2) 自带SBEC的电子调速器,给舵机供电是线性模式,输出电压5.5V,舵机可以带1A负载。
 3) OPTO表示电子调速器没有内置BEC,工作时需要单独多级,接收机供电。
 4) 可以定制个性化的BEC。
 5) 可以根据客户的要求制定个性化的电子调速器。

03 连接线说明

(为避免短路和漏电,链接处均使用热缩导管绝缘。)

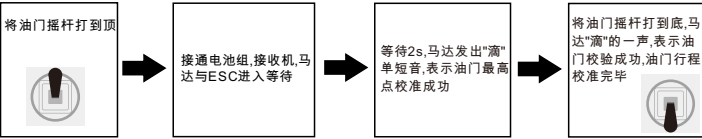


04 第一次使用电子调速器

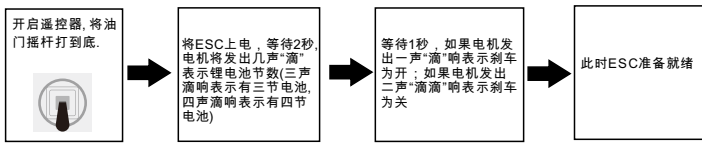
•第一次接通电子调速器需要设置油门行程

飞盈佳乐ESC的特点是根据不同的发射机设置最佳油门行程,ESC能够通过发射机的整个油门行程来获取最平稳的油门线性,目的是让ESC获取并记忆发射机的油门输出信号,此操作只需要进行一次,更换发射机是需要重复此操作步骤。
 注意:使用时,连接电池组之前,务必仔细检查所有插头连接的极性是否正确,以及安装是否牢固,防止因为错误。连接极性或短路而损坏电子调速器。

1.油门行程校准:

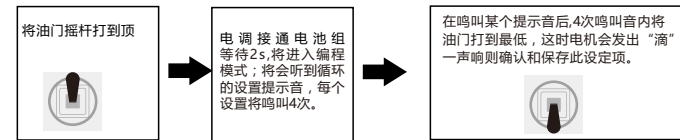


2.ESC正常启动程序如下所示:



注意:您的航模如果在飞行过程中马达突然停转,应当立即将油门拉杆推至最低位置,再推起油门拉杆,这样马达将重新启动,此时将油门控制在较小位置,立即降落航模飞机。

05 遥控器编程操作说明



*除使用遥控器编程外,推荐使用Flycolor航模编程卡进行编程,请联系Flycolor获得更多信息。

编程设定项说明	
编程设置: (提示音5种代号如下)	
A=滴-	短音
B=滴-滴-	3连音
C=-滴	渐变音+滴
D=滴\	低音
E=滴-	长音
音乐1	油门 A-A-A-A
音乐2	刹车 B-B-B-B
音乐3	镍氢电池 C-C-C-C
音乐4	锂电池 D-D-D-D
音乐5	低 (2.8V) E-E-E-E
音乐6	中 (3.0V) AA-AA-AA-AA
音乐7	高 (3.2V) BB-BB-BB-BB
音乐8	恢复出厂值---出厂时的默认值 CC-CC-CC-CC
音乐9	自动 DD-DD-DD-DD
音乐10	低 EE-EE-EE-EE
音乐11	高 AAA-AAA-AAA-AAA
音乐12	超柔和 BBB-BBB-BBB-BBB
音乐13	柔和 CCC-CCC-CCC-CCC
音乐14	加速启动 DDD-DDD-DDD-DDD
音乐15	关闭 EEE-EEE-EEE-EEE
音乐16	直升机模式1 AAAA-AAAA-AAAA
音乐17	直升机模式2 BBBB-BBBB-BBBB-BBBB
音乐18	马达正反设置 CCCC-CCCC-CCCC-CCCC
音乐19	8K DDDD-DDDD-DDDD-DDDD
音乐20	PWM马达频率 16K EEEE-EEEE-EEEE-EEEE
音乐21	降功率保护 AD-AD-AD-AD
音乐22	低电压保护模式 关断输出 AE-AE-AE-AE

06 编程参数说明

1.刹车:开/关

- 开一:当油门处于最小位置时,螺旋桨立即停止
- 关一:当油门处于最小位置时,螺旋桨自由停止

2.电池类型: LiPo (锂电)或NiCd/NiMH(镍氢/镍镉)

NiCd/NiMH- 是对 NiCd/NiMH电池设置低压保护点。
 Lipo-是对Lipo电池设置低压保护点,并在电池组内自动侦测电池的节数。
 备注: 对NiCad/NiMH 电池的选择会使电子调速器自动将中止电压点设置为出厂默认值的65%,如需要更改,可通过低压保护功能更改中止值,一旦NiCad/NiMH电池组接通电源,电子调速器便会读取其起始电压,此电压将被用做中止电压点的参考值。

3. 低压保护功能:低/中/高

- 1) 对于 Ni-xx 电池组来说:低/中/高三个阈值,中止电压是电池组初始电压值的 50%/65%/75%。
- 2) 对于Li-xx电池组来说:可自动计算电池数量,除了确定电池类型外无需用户设置。电子调速器为低压保护点提供、了三个选择档位:低(2.8V)/中(3.0V)/高(3.2V)。
 例如: 对于一个14.8V/4节电池的LiPo电池组来说, 低压中止保护电压: 11.2V为低 /12.0V为中 /12.8V为高。

4. 恢复出厂默认设置

- 电子调速器出厂默认状态:
- 1) 刹车:关
 - 2) 电池类型:有自动侦测功能的Lipo电池。
 - 3) 低中止点:中 (3.0V/65%)
 - 4) 马达进角设置:自动
 - 5) 加速度启动设置:柔和
 - 7) 直升机模式设置:关
 - 8) 工作频率设置:8kHz
 - 9) 低压保护模式:减小功率

5. 马达进角设置:自动/低/高

自动-电子调速器自动侦测最适宜的马达进角设定。
 低(7-22度)--是为大多数的内转子马达设置。
 高(22-30度)--为6极和6极以上的外转子的马达设置。
 大多数情况下,自动进角适用于所有类型的马达,但为了提高效率,我们建议对2级马达使用低进角设置(一般的内转子),6极和6级以上(一般的外转子)马达使用高进角对于较高的转速马达,可以设定高进角。某些马达需要特殊的进角设置,如无法确定,我们将以采用那大制造商推荐的进角设置或使用自动侦测进角设置。
 备注: 马达的进角设置修改成功后,请先在地面上调试马达。

6.加速启动设置:提供带有线性油门响应的快速启动。

超柔启动:从开始到最大的速度油门响应滞后1.5秒,此设置能够防止精密齿轮/传动装置在瞬时负载下脱落。建此设置用于装有变速箱的固定翼模型或直升机。
 柔和启动:从开始到最大速度油门响应滞后1秒,建议此设置用于装有变速箱的固定翼模型或直升机。
 加速启动:从开始到最大速度油门响应无滞后,建议对装有直接驱动固定翼模型使用。

7. 直升机模式:(针对直升机应用)

直升机关闭
 直升机1:从开始到最大速度油门响应滞后5秒,但启动后若关闭油门,再次启动时则均以普通模式启动。
 直升机2:从开始到最大速度油门响应滞后5秒,但启动后若关闭油门,再次启动时则均以普通模式启动。
 备注:一旦工作在直升机模式,无论电子调速器之前有怎样的设置,电子调速器刹车和低压保护类型设置都在分别被自动重新设置为无刹车和减小功率模式。

8.马达转向/正/反转

大多数情况下,马达正/反转可以通过交换电子调速器连接马达的三根输出线中的任意两根实现的。在马达接线已被直接焊接在电子调速器上时,可以通过改变电子调速器上的设置值来使马达改变转向。

9. 工作频率: 8kHz / 16kHz

8 kHz-为2级马达设置的工作频率,比如内转子。
 16 kHz-为2个以上级的马达设置的工作频率,比如外转子。
 虽然工作频率16kHz能给我们的固定翼或直升机提供劲暴的动力,但由于16kHz所产生的较高RF噪音,所以默认设置为8kHz。

10. 低压保护模式,减小功率/立即停止

减小功率-当达到预设的低压保护阈值时,电子调速器便会减小马达的输出功率(推荐)
 立即停止-当达到预设的低压保护阈值时,电子调速器立即关断输出马达功率

07 保护功能

保护功能	保护描述
启动保护	当推油门启动后,如在两秒内未能正常启动电机,ESC将会关闭电机,油门需要重新设置,才可以重新启动。可能原因:ESC与电机接线断开或接触不良、螺旋桨被其他物体阻挡、减速齿卡死等
温度保护	当电子调速器工作温度超过 100 度时,ESC将自动降低输出功率进行保护,但不会将输出功率全部关闭,最多降到全功率的 40%,以保证电机留有一定动力,避免炸机。当温度下降后,电子调速器将逐渐恢复到最大动力
油门信号丢失保护	当ESC侦测到油门信号丢失2s后,将自动减小对马达的输出功率,然后油门信号再次丢失超过2s,ESC将自动关断马达。如果在马达的输出功率减小过程中油门信号恢复,ESC可以立即恢复油门控制。这样在瞬间信号丢失情况下(2s以下),ESC并不会进行油门保护,只有当遥控信号确实长时间丢失,才进行保护,但ESC不是立即关闭油门,而是有一个逐步降低输出功率的过程,给玩家留有一定的救机时间,兼顾安全性和实用性

• 报警音:设计可听见的报警音,供电使用者判断通电后的异常情况。

1. 上电后无法进入工作模式:说明还没有设置油门行程。
2. 持续的滴滴声:说明油门拉杆不在最小位置上。
3. 滴一声响后有短暂的停顿:说明电子调速器不能侦测到来自接收机正常的油门信号。
4. 滴一声响后有一秒的停顿:说明电池组电压在可接受范围之外(一旦电池被连接,电调便会进行自检并检验电池电压)。

08 使用时注意的安全常识

- 请勿私自拆卸电子调速器上的任何电子元器件,否则会造成永久性的损坏或信息丢失。
- 检验接收机装置设置正确,首次测试ESC和马达时,如果尚未确认接收机装置上的设置正确,勿在马达上安装螺旋桨或传动小齿轮。
- 勿使用裂开或被刺破的电池组。
- 勿使用容易过热的电池组。
- 勿使用不合乎标准的电缆绝缘材料。
- 勿使用不合乎标准的电线连接器。
- 电池或伺服系统的数量不要超过电子调速器的规定。
- 电池电压值不要超出电子调速器的工作电压范围。
- 勿使用不合格的电池组。
- 注意电池极性,错误的电池极性会损坏电子调速器。
- 请确保该电子调速器不会用于载人飞行器及其他载人机器上。
- 勿将ESC置于潮湿或强光地方。
- 勿在电机转动条件下抽掉电池,这样可能引发的峰值电流导致ESC 烧坏。
- 勿在ESC 外包装任何物品,尽量将ESC 安装在通风散热好的位置。

09 常见的问题处理方法

出现的问题	可能的原因	解决方法
上电后,马达不工作,并未发出任何音乐声,伺服系统也未运行	电池组与ESC之间接触不良,电源没有接通	重新清理插头或更换插头,检查并确认接线极性
	ESC信号线与接收机连接极性错误	检查信号线,确保极性正确
	焊接不牢固,容易造成接触不良	再次焊接连接线
	电池接线极性错误	检查电池组,用符合规格满电的电池组替换
上电后,ESC有自动检测电池节数声音,但马达不能启动	ESC没有设置油门行程	重新进行油门行程设置
	ESC与马达之间接触不良,或焊接不牢	检查连接器终端或替换连接器或再次焊接马达接线
ESC工作,但马达不工作,未发出音乐声,ESC上电后,发出报警音(滴滴两响后有短暂停顿)	马达不良	更换马达
	ESC 低压保护,电池电压不在可接受范围内	检查电池组电压,更换为刚充满电的电池组
上电后,马达不工作但发出报警音(滴滴一声响后有短暂停顿)	接收机油门信号无输出	检查并确认信号线与接收机油门通道是否连接正确 检查发射器和接收机,确认有信号输出
上电后,马达不工作,发出持续地滴滴响	油门拉杆未放置最小位置上	将油门拉杆移至最小位置,重新设置油门行程
上电后,马达不工作,ESC发出两声长响之后,有两声短暂的滴滴响	油门通道正反被错置,导致ESC进入程序设计模式	参考遥控器的说明书,调整油门通道正反设置
马达反向运行	马达与ESC连接线路错误	1.直接用遥控器或编程卡通过改变马达转向设置,改变方向
飞行过程中,马达中途停转	电池电压低于设定的低压保护电压阈值,且低压保护模式为关断方式	1.正确设置低压保护电压阈值;电池充满飞行;低压保护模式设为降低功率模式(默认模式)。如果在飞行中发现功率降低,请及时降落您的航模飞机 2.控制模型飞机飞行在遥控器遥控的范围内 3.注意遥控器电池电压,若电压降低较多,需及时降落模型飞机
	油门信号丢失	1.检查遥控器是否操作得当 2.检查遥控器与接收机匹配是否正确 3.使用环境中没有强烈的电磁干扰,尝试重新上电启动以恢复正常工作,若该问题反复出现,说明飞行地外部干扰过于强烈,请更换飞行场地
接线接触不良	检查电池组插头,电池输出线和马达连接线是否连接可靠	

Thank you for using the smart power electric speed controller (ESC) for brushless motor designed and produced by Shenzhen Flycolor Electron Co., LTD. Wrong use and operation may cause personal injuries and damages on the equipment due to the strong power at the starting of the product. We strongly recommend customers to read the specification carefully before using the product and operate the product strictly in accordance with the operating provisions. We assume no responsibilities generated from the application of the product, including but not limited to liabilities for damage of incidental losses or indirect losses. Meanwhile, we assume no responsibilities generated from the disassembly and modification by users themselves and assume no responsibilities caused by products from the third party.

We have the right to alter products including appearance, performance parameter and operating requirement without advanced notice. We make no guarantee, declaration or promise on whether the product is suitable for specific purpose of users.

01 Main features

- Use powerful and high-performance MCU processor. The users can set function of use according to their requirements. It fully reflects the smart property of our products as a unique advantage.
- Support unlimited rotate speed of brushless motor.
- Support the function of fixed speed.
- Delicate circuit design with strong anti-interference.
- The starting mode can be set. The response speed of throttle is very quickly and with very stable linear of speed regulation. It can be used in fixed wing aircraft and helicopter.
- Threshold values of low-voltage protection can be set.
- With internal SBEC, the operating power to start steering engine is strong and the power dissipation is small.
- Multi protection function: protection for abnormal input voltage/ protection for low battery/ protection for overheat/protection of lowering power when lost of signals from throttle.
- Good safety performance : the motor will not start at the time of power on regardless of the location of pull rod of throttle in controller.
- Protection for overheat: the output power will lesson to half when the temperature reaches 100°C during the operation of ESC. The output power will automatic recover when the temperature is under 100°C.
- Supports with operation setting for all controller and setting of programming panels .
- Set alarm sound. And judge the working situation after power on.
- The company has completed intellectual property on the product. The product can be updated and upgraded. The product can be made to customers' requirements.

02 Specifications

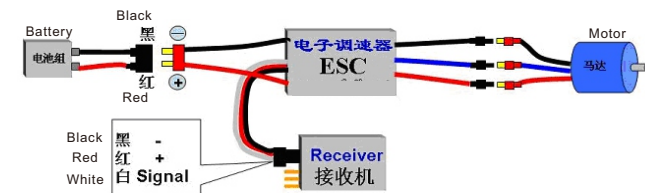
Model	Con. Current	Burst Current (10S)	BEC	BEC mode	LiPo cells	Ni-MH cells	SIZE (mm)	Weight (g)
FLY-6A	6A	8A	5V/0.5A/2A	UBEC	2-3S	5-9S	24*13*5	6.7g
FLY-6A	6A	8A	No	/	2-3S	5-9S	24*13*5	5.7g
FLY-10A	10A	12A	5V/3A-1A	SBEC/UBEC	2-3S	5-9S	32*19*5	10.1g
FLY-10A OPTO	10A	12A	No	/	2-3S	5-9S	32*19*5	9.1g
FLY-12A	12A	15A	5V/1A-2A	UBEC	2-3S	5-9S	24*18*6	9g
FLY-12A OPTO	12A	15A	No	/	2-3S	5-9S	24*18*6	8g
FLY-15A	15A	20A	5V/2A	UBEC	2-4S	5-12S	32*19*5	10.8g
FLY-15A OPTO	15A	20A	No	/	2-4S	5-12S	32*19*5	9.8g
FLY-20A	20A	25A	5.5V/3A-1A	SBEC/UBEC	2-4S	5-12S	43*26*11	34g
FLY-20A OPTO	20A	25A	No	/	2-4S	5-12S	43*26*11	32g
FLY-30A	30A	40A	5.5V/3A-1A	SBEC/UBEC	2-4S	5-12S	43*26*11	43.3g
FLY-30A OPTO	30A	40A	No	/	2-4S	5-12S	43*26*11	40.3g
FLY-40A	40A	60A	5.5V/4A	SBEC	2-5S	5-15S	35*31*17	43.8g
FLY-40A OPTO	40A	60A	No	/	2-5S	5-15S	35*31*17	40.3g
FLY-45A OPTO	45A	70A	No	/	3-8S	9-25S	54*31*14	58.5g
FLY-50A	50A	80A	5.5V/4A	SBEC	2-6S	5-18S	51*32*17	79.7g
FLY-50A OPTO	50A	80A	No	/	2-6S	5-18S	51*32*17	75.5g
FLY-60A	60A	80A	5.5V/4A	SBEC	2-6S	5-18S	55*36*17	64.7g
FLY-60A OPTO	60A	80A	No	/	2-6S	5-18S	55*36*17	60.7g
FLY-70A	70A	100A	5.5V/4A	SBEC	2-6S	5-18S	55*32*17	72.2g
FLY-70A OPTO	70A	100A	No	/	2-6S	5-18S	55*32*17	68.2g
FLY-80A	80A	100A	5.5V/4A	SBEC	2-6S	5-18S	55*32*17	75.5g
FLY-80A OPTO	80A	100A	No	/	2-6S	5-18S	55*32*17	70.5g
FLY-90A	90A	120A	5.5V/4A	SBEC	2-6S	5-18S	55*32*22	90.6g
FLY-90A OPTO	90A	120A	No	/	2-6S	5-18S	55*32*22	86.6g
FLY-100A	100A	140A	5.5V/4A	SBEC	2-6S	5-18S	55*32*22	102.9g
FLY-100A OPTO	100A	140A	No	/	2-6S	5-18S	55*32*22	98.9g
FLY-110A	110A	150A	5.5V/4A	SBEC	2-6S	5-18S	55*32*22	102.2g
FLY-110A OPTO	110A	150A	No	/	2-6S	5-18S	55*32*22	98.2g
FLY-120A	120A	150A	5.5V/4A	SBEC	2-6S	5-18S	55*32*22	103g
FLY-120A OPTO	120A	150A	No	/	2-6S	5-18S	55*32*22	99g

- Notice:
- 1) The ESC with SBEC supply steering engine with switching power. The output voltage is 5.5V. The load current of steering engine is 4A. At the moment of 2 seconds can reach 8A.
 - 2) The ESC with UBEC supply steering engine with linear power. The output voltage is 5.5V. The load current is 1A.

- 3) OPTO means that there is no BEC inside ESC. The steering engine and receiver shall be supplied with power separately.
- 4) Customized BEC can be made according to customers' requirements.
- 5) Customized ESC can be made according to customers' requirements.

03 Wiring diagram

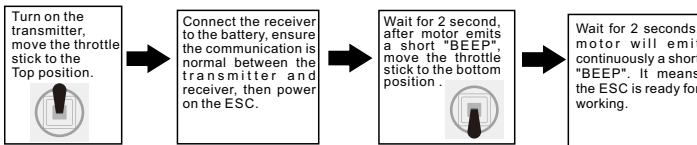
*Please ensure all solder joints are insulated with heat shrink where necessary.



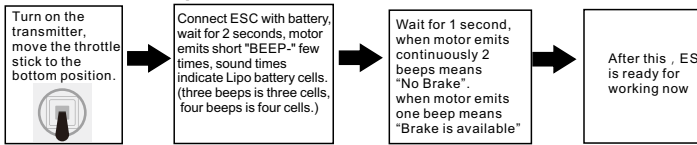
04 First time to use the ESC

The feature of Flycolor ESC is to set best routine of throttle according to different transmitters. The ESC can obtain most stable throttle linear response through the total routine of throttle in transmitters. The objective is let the ESC to obtain and remember the output signals of throttle in transmitters. The operation needs to be carried for one time. Please repeat the operation when change transmitters.

1. Throttle Range calibration



2. Normal start-up



Remark: if the motor suddenly stops when your model airplane are flying, you shall immediately push the pull rod of throttle to the lowest position and then push to the high position. Then the motor will restart. You shall land the model airplane immediately with throttle controlled with a lower position.

06 Parameters instruction

1. Brake: turn on/turn off

Turn on: the propeller stops immediately when move the throttle stick to the bottom position.
Turn off: the propeller stops naturally when move the throttle stick to the bottom position.

2. Battery types: LiPo or NiCd/NiMH

NiCd/NiMH- set protection point for NiCd/NiMH.

LiPo-set protection point for Lipo and detect numbers of battery automatically in the battery pack.

Remark: the choice of NiCd/NiMH battery will make the ESC automatically set the cutoff value of voltage at 65% of factory defaults. The cutoff value can be modified through the function of protection for low voltage in case of changes. Once the battery pack of NiCd/NiMH connects to the power, the ESC will read its initial voltage. The voltage will used as a reference value for cutoff value of voltage.

3. Battery protect: low/middle/high

1) In case of Ni-xx battery pack: the cutoff voltage is 50%/65%/75% of the initial voltage of battery pack .
2) In case of Li-xx battery pack: the number of batteries can be calculated automatically. Users need not to set anything except the types of battery. The ESC provides three optional gears for protection point of low voltage: low(2.8V)/middle(3.0V)/high(3.2V).
For example: if the battery voltage is 4S ,so the cutoff voltage for low voltage is 11.2V as low /12.0V as middle /12.8V as high.

4. Recover to factory default setting.

- 1) The factory default setting of ESC:
- 2) The brake: off
- 3) The types of battery: Lipo battery with automatic detection.
- 4) The cutoff value under low voltage: middle (3.0V/65%)
- 5) The angle of entrance in motor: automatic
- 6) Setting for accelerated startup: smooth
- 7) The setting Mode for helicopter: off
- 8) The frequency of working: 8kHz
- 9) Protection mode under low voltage: reduce power

5. Timing: automatic/low/high

Automatic-the ESC detect the most suitable motor timing automatically.

Low (7-22 degree) – suitable for the setting of most motors with inner rotor.

High (22-30 degree)-suitable for the setting of most motors with outer rotor and 6 poles or more than poles. Under most cases, the Automatic is suitable for all motors. However, in order to increase efficiency, we recommend using low timing for 2 poles (generally inner rotor), and using high timing for 6 and more than 6 poles (generally outer rotor). We can set a high timing for motors with higher rotate speed. Some motors need special timing. We recommend using the timing recommended by motor producers or automatic detected timing in case of uncertainty.

Remark: please debug the motor on the ground after successfully altering the motor timing.

6. Setting for accelerated startup: provide rapid accelerated start up with linear throttle response.

Ultra smooth startup: the lag time of throttle response between the starting and highest speed is 1.5 seconds. The setting mode can prevent the precision gear/gearing dropping under momentary load. The setting mode is recommended to use in fixed wing model with gear box or helicopter.

Smooth startup: the lag time of throttle response between the starting and highest speed is 1 second. The setting mode is recommended to use in fixed wing model with gear box or helicopter.

Accelerated startup: there is no lag time of throttle response between the starting and highest speed. The setting mode is recommended to use in fixed wing model with direct drive.

7. The Mode for helicopter: (use in application of helicopter)

Turn off the helicopter

Helicopter 1: the lag time of throttle response between the starting and highest speed is 5 seconds. However, if the throttle is turned off after startup, the next startup will commence in common mode.

Helicopter 2: the lag time of throttle response between the starting and highest speed is 15 seconds. However, if the throttle is turned off after startup, the next startup will commence in common mode.

Remark: once working under mode for helicopter, the brake and types of protection under low voltage will be reset automatically to mode of no brake and reduce power mode separately regardless of previous setting of ESC.

8. Motor Rotation Switching (clockwise/anticlockwise)

In most cases, the clockwise and anticlockwise rotation of motor can be realized by exchanging any two lines among the three output lines in the ESC connected to the motor. The direction of rotation can be changed by altering the setting value on the ESC in case that the wire connected to motor has been directly welded on the ESC.

9. Operating frequency: 8kHz / 16kHz

8kHz-the Operating frequency for motor with 2 poles, for example inner rotor

16kHz-the Operating frequency for motor with poles more than 2, for example outer rotor

Although the operating frequency of 16 kHz can provide strong power for fixed wing or helicopter, the default setting is 8 kHz for there are louder RF noise under the operating frequency of 16 kHz.

10. Protection mode under low voltage: reduce power/ halt immediately

Reduce power- the ESC will reduce the output power of motor when reaches default protection threshold for low voltage (recommend)

Cutoff output- the ESC will cutoff the output power of motor when reaches default protection threshold for low voltage

07 Protections

Protection	Descriptions
Start-up protection	If the motor fails to startup normally in two seconds after push the throttle to start, the ESC will cut off the motor. The throttle shall be reset to commence a restart. Possible reasons: there is a disconnection or poor contact in wiring between the ESC and motor. The propeller is stemmed by other objects. The speed reduction gear is badly blocked.
Over-temperature Protection	When the working temperature in the ESC is higher than 100°C, the ESC will reduce the output power automatically to commence protection, but will reduce the output power to 40% of full power to reserve some power for motor and avoid crash landing instead of turning off all output power. The ESC will recover to max power as the temperature falls.
Throttle Signal Loss Protection	The ESC will reduce the output power to motor when the ESC detect that there are 2 seconds' lost of throttle signals. If there another 2 seconds' lost of throttle signals, the ESC will cut off motor automatically. If the throttle signals recover during the reduction of output power of motor, the ESC will recover control of throttle at once. In this method, in the case of momentary lost of signals (within 2 seconds), the ESC will not commence the protection of throttle. Only when the control signals have been lost for a long time, the ESC will commence protection. However, the ESC will reduce the output power gradually instead of cutting off output power immediately so that the players will have certain period to rescue the machine. It has both safety and practicability.

• The warning tone:

The warning tone is set as audible sound to help users judge abnormal condition after turn on the power.

1. Fail to enter working mode after turn on the power: the routine of throttle has not been set yet.
2. Continuing beeps: the pull rod of throttle is not in the lowest position.
3. There is a short pause after a beep: the ESC can not detect normal throttle signals from receiver.
4. There is a pause of one second after a beep: the voltage of battery pack is out of acceptable limit (once the battery is connected, the ESC will carry out a self-checking and check the voltage of battery.)

08 Attentions

Please pay attention to the following safety information when using.

- Never disassemble any electro components in the ESC by yourself, or permanent damages or lost of information will occur.
- Check the setting of receiver. Do not install propeller or small driving gear on motor if you haven't confirm that the setting of receiver is correct when test the ESC and motor for the first time.
- Do not use cracked or broken battery pack.
- Do not use battery pack easily get overheat.
- Do not use short-cut battery.
- Do not use cable insulation material against standards.
- Do not use cable connector against standards.
- The number of battery or servo system shall not exceed the rules for ESC.
- The voltage of battery shall not exceed the scope of working voltage of ESC.
- Pay attention to the polarities of battery. Wrong polarities will damage the ESC.
- Be sure that the ESC will not use in manned craft or other manned machines.
- Do not place the ESC in moist or over exposure.
- Do not take out battery when the motor is working, for the generated large peak current will damage the ESC.
- Do not pack anything outside the ESC. Install the ESC in places with good ventilation and heat dissipation as far as possible.

09 Trouble shooting

Trouble	Reason	Solution
After power on, the motor fails to work and there is no music. The servo system fails to work and switch on.	There is a poor contact between battery pack and ESC. The power is off.	Clean the plugs again or change plugs. Check and confirm the polarities of wiring.
	The polarities of connection between receiver and signal wires of ESC are wrong	Check the signal wire to ensure the polarities are correct.
	The welding is not firm so a poor contact easily happens.	Weld the connecting line for the second time.
After power on, there is sound that ESC automatically check the number of batteries, but the motor fails to work.	The wiring polarities of batteries are wrong.	Check the battery pack and exchange battery pack with full voltage in accordance with standards.
	Other quality problems in ESC.	Change ESC.
After power on, there is sound that ESC automatically check the number of batteries, but the motor fails to work.	The ESC fails to set routine of throttle.	Reset the routine of throttle.
The ESC work successfully, but motor fails to work. There is no music.	There is a poor contact or welding between ESC and motor.	Check the end of connector or change connector or weld the wiring of motor again.
After power on of ESC, motor fails to work and gives out warning tone(two beeps and short pause)	Bad motor.	Change motor.
After power on of ESC, motor fails to work but gives out warning tone(two beeps and short pause)	Protection for low voltage in ESC. The voltage of battery is out of acceptable limit.	Check the voltage of battery group, change with battery group of full voltage.
After power on of ESC, motor fails to work and gives out continuing beeps	There is no output signal of throttle in receiver.	Check and confirm the connection between signal wire and throttle in receiver is correct. Check the transmitters and receivers to ensure that there are output signals.
After power on, motor fails to work and gives out two long beeps and then two short beeps	The pull rod of throttle is not in the lowest position	Push the pull rod of throttle to the lowest position and reset the routine of throttle.
After power on, motor fails to work and gives out two short beeps	ESC enters programming mode due to wrong pros and cons setting of throttle channel.	Adjust the pros and cons setting of throttle channel according to the specification of remote control.
The motor is in a inverted running	The order of wiring between motor and ESC is wrong.	1. Alter any two connection line among three connection line between ESC and motor. 2. Change direction by changing the rotation setting of motor directly with remote control or programming panels.
The motor is in a inverted running	The voltage of battery is lower than default protection threshold for low voltage, and the protection mode for low voltage is cut off.	1. Set the protection threshold for low voltage correctly. Fly with battery of full voltage. The protection mode for low voltage is set in mode of reduces power (default mode). Please land your model airplane in time if you find reduction of power during the flying.
		2. Control the model airplane flying in the scope of remote control.
		3. Pay attention to the voltage of battery in remote control. Please land the model airplane in time if there is large reduction in voltage.
Lost of throttle signals		1. Check the operation of remote control is correct. 2. Check if the remote control is suitable to receiver. 3. Please try restarting to recover normal operation if there is strong electromagnetic interference in the operating environment. If the problem occurs again and again, please change flying site for there is too strong interference from outside environment in this flying site.
Poor contact in wiring.		Check the connection between plug of battery pack, output line of battery and connection line of motor is reliable.