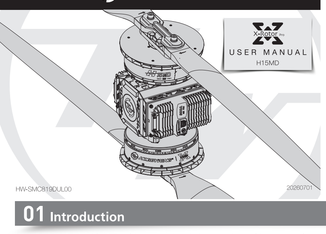
HOBBYWING



HW-SMC0119DUL00 20260701

Thank you for purchasing this product! The brushless propulsion system is highly powerful, and improper use may lead to personal injury and equipment damage. Therefore, we strongly recommend that you carefully read this manual before using the equipment and strictly follow the specified operating procedures. Once you use the product, it is deemed that you have read and accepted all the contents of this manual. We shall not assume any liability arising from the use of this product or any unauthorized modification of the product, including but not limited to liability for incidental or consequential damages.

This propulsion system is an industrial-grade accessory for unmanned aircraft. If you have more specialized application requirements, please contact us.

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01 Introduction

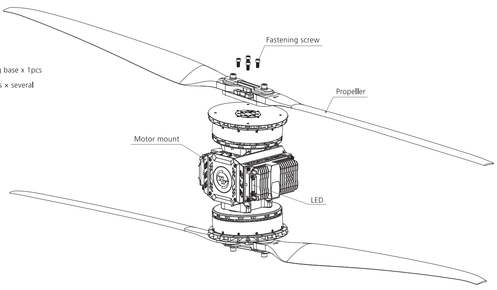
H15MD brushless propulsion system is an industry version multi-rotor propulsion system that adapts to a maximum single-axis takeoff weight of 60 kg load, with a maximum single-axis thrust of 145 kg ; adapted to 80 mm carbon fiber tube arm, overall protection level IPX6 , efficient heat dissipation, can be used in complex environments, designed for logistics, emergency rescue, construction lifting and other fields of heavy-loaded multi-rotor drone applications , providing a one-stop power solution. For the drone application scenario of the heavy-loaded industry, the FOC algorithm has been specifically optimized. This propulsion system supports both digital and analog throttle modes, which are of mutual redundancy and seamless switch. This product is equipped with protection functions such as power-on self-check, power-on abnormal voltage protection, overcurrent protection, stall protection, etc. The ESC communication protocol is Cyphal (i.e., UAVCAN), users can freely choose either HWCAN (default at factory) or DroneCAN, making it compatible with mainstream closed-source and open-source flight controllers on the market, offering real-time data transmission. Build-in black box functions, which are highly beneficial for post-event data analysis. Additionally, it has OTA upgrade capabilities and can upgrade the propulsion system firmware through the flight controller.

02 Precautions

- When flying, please stay away from crowds, high-voltage lines, obstacles, etc., and be sure to comply with local laws, regulations, and safe flight regulations.
- Do not fly in extreme weather conditions such as strong winds, heavy rain, snow, heavy fog, thunder and lightning, sandstorms, icing, etc.
- Do not use when the ambient temperature exceeds 60°C or is below -40°C. If used outside the ambient temperature operating range, the ESC may malfunction and cause the aircraft to crash.
- The driven algorithm of ESC included in the propulsion system is FOC and requires strict matching of only one configuration of motor and propeller model. Please use the original factory-matched propeller model to avoid triggering ESC protection due to improper propeller matching, and even causing a crash.
- This product is an integrated propulsion system, **please do not modify this product without permission** (including but not limited to modifying it into a coaxial structure, replacing the motor, replacing the ESC, using non-matching model propellers, using propellers not from Hobbywing, etc.) . **If any loss is caused after unauthorized modification, the manufacturer shall not be liable.**
- **Before each takeoff, please confirm that the single-axis takeoff weight (total takeoff weight ÷ number of axis) does not exceed the maximum single-axis takeoff weight of a single power unit. The redundant thrust between the maximum single-axis takeoff weight and the maximum thrust is only used for aircraft maneuvering and wind resistance, do not use the maximum thrust as the single-axis takeoff weight! Overloading will cause the temperature of the motor and ESC to rise rapidly and may lead to a crash. The manufacturer shall not be liable for any losses caused by overloading.**
- Do not disassemble the ESC or motor without permission to avoid damaging the motor or affecting the ESC's protective capabilities.
- The power and signal connectors of the product have been welded during factory production. If you need to change or weld the input and output connectors of the ESC, please use a welding device with sufficient power and ensure that the welding is firm and reliable.
- Please make sure to carefully connect all components. If there is poor contact, you may not be able to control the aircraft properly, or other unpredictable situations such as equipment damage may occur.
- When installing and testing the product, please remove the propeller to prevent unknown risks. Before use, please check whether all components are in good condition. If any damage is found, please contact after-sales service in time for replacement.
- Please maintain a safe distance from the propeller that is rotating at high speed to prevent being cut by the blades. Do not install the propeller during ground testing to avoid unnecessary risks.
- Before flight, check whether the screws of the connecting structural parts are secured and whether the motor is level. If any blade damage is found, please replace it immediately.
- Motors and ESCs will generate heat during operation, and long-duration/heavy-loaded flights will produce high temperatures. Do not touch the motors and ESCs immediately after landing to avoid burns.
- Please use original factory parts for repair and replacement. For parts purchase, please contact the distributors or Hobbywing official. Do not use parts from other manufacturers.
- This product adopts a fully isolated design between protective earth (PE), power circuits, and low-voltage signal circuits, ensuring low-impedance connection (common ground) between the motor base and ESC housing.
- The ESC has CAN functionality, this manual only covers the CAN communication part. The CAN digital throttle must be used in conjunction with a flight controller, i.e., the flight controller must has CAN throttle output functionality. If there are multiple ESCs on one aircraft, then Node IDs and Throttle IDs of different ESCs on one aircraft must not be the same. Otherwise, when using the CAN function, multiple ESCs with the same Node ID or Throttle ID will be recognized as one ESC. The factory default Node ID is 1 and the Throttle ID is 1. For related usage methods of flight controller, please contact the manufacture of flight controller, no further explanation will be provided here.
- When using the CAN digital throttle as priority, it is recommended to set the flight controller's idle throttle value to 6%.
- The ESC does not come with a CAN termination resistor by default and needs to be uniformly matched according to the overall CAN topology.

03 Propulsion System Composition

- Motor x 2pcs
- ESC x 2pcs
- Propeller x 2pcs
- Motor mounting base x 1pcs
- Fastening screws × several
- LED set

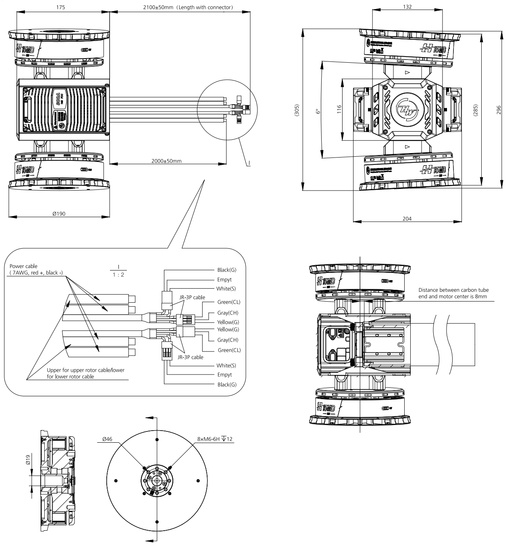


- When installing the propulsion system on the drone frame, please pay attention to the rotation direction of the motor.
- The yellow, gray, and green cable serves as the data output and upgrade cable (which can be used for upgrading the firmware of ESC). The yellow wire is GND, the gray wire is CAN-High (hereinafter referred to as CH), and the green wire is CAN-Low (hereinafter referred to as CL); the black and white cable is the ESC throttle signal cable, with the black wire being GND and the white wire being the throttle (PWM) signal wire. The ESC throttle signal cable needs to be plugged into the corresponding motor control interface on the flight controller.
- The data output cable can output data such as throttle, RPM, bus current, bus voltage, capacitor temperature, MOSFET temperature, etc. in real time.

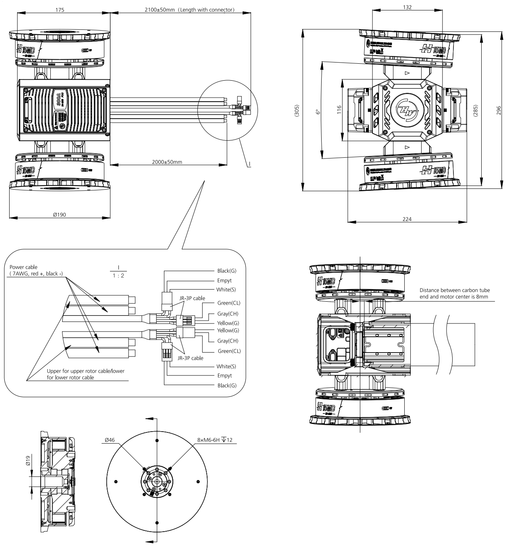
04 Dimensions

D80 Dimension Diagram

Motor-45KV

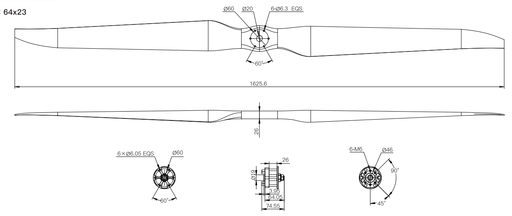


Motor-35KV

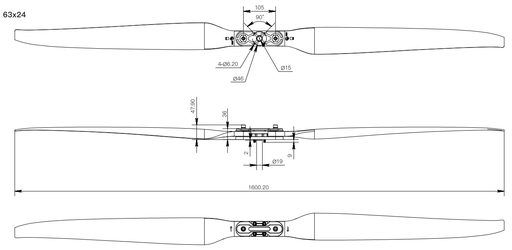


Propeller Drawings

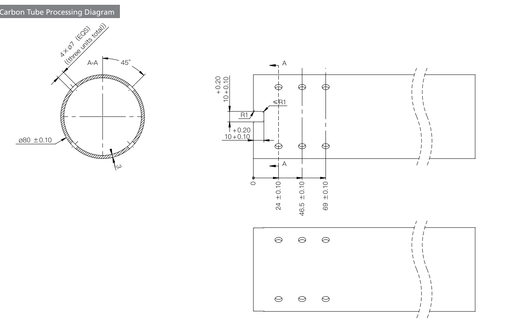
MSC 64x23



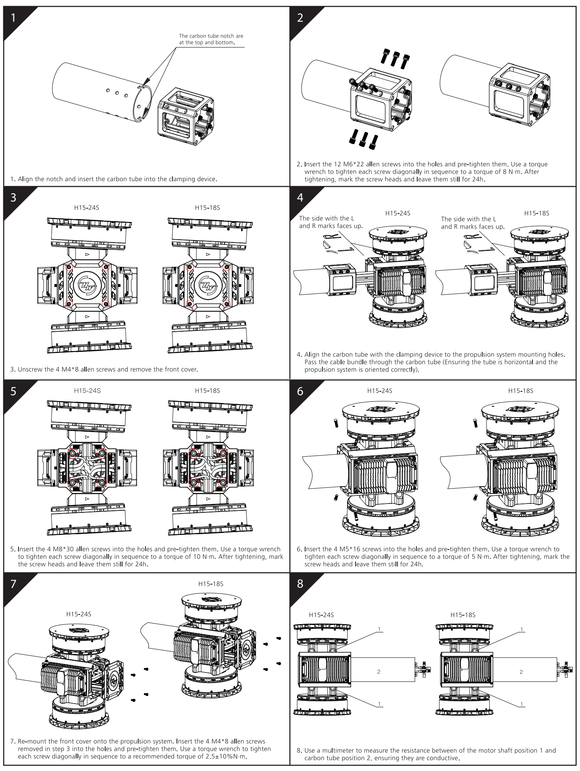
MFC 63x24



D80 Carbon Tube Processing Diagram



Propulsion System Assembly Diagram



Note:
1.Torque recommendation for propeller M6 lock screw: 8 N·m (thread locker required); Torque recommendation for quick-release thin nut (left-hand thread): 20 N·m, thick nut (right-hand thread): 30 N·m (thread locker not required), Mark a reference line after secure locking.
2, The carbon tube needs to be processed with through holes, limit grooves, etc. The specific processing dimensions can be found in the carbon tube processing drawings;
3, All screws require an appropriate amount of thread locker during assembly (to 1/2 screw length), Loctite 243 is recommended.
4, The amount of thread locker and the tightening torque must be strictly followed according to the assembly diagram, with regular inspections to ensure the screws are secure.

05 Specifications

Propulsion System: H15MD-18S
Maximum single-axis takeoff weight: 60 kg (at sea level)
Maximum thrust: 145 kg（at sea level）
Rated voltage: 18S-69V
Compatible lithium batteries: 18S（LiPo）
Operating ambient temperature: -40~60 ℃
Recommended outer diameter of carbon tube (and wall thickness): 80mm+Wall thickness 3mm
Total weight (with cables，without propeller): 9800±200g
Ingress Protection level: IPX6
Efficiency of maximum single-axis takeoff weight: 7.4 g/W
Throttle source: PWM + CAN
Rated output power (Max continuous): 7000 W
Power cable specifications: 7AWG 2000±50 mm
Signal cable length: 2200±50 mm

ESC
Voltage range: 36~80 V
Continuous current: 120 A (non-enclosed environment temperature ＜35/40℃)
Peak current: 300 A (non-enclosed environment temperature ＜35/40℃) (3s)
PWM pulse width: 1100~1940 μs
PWM throttle frequency: 50~500 Hz
PWM signal level: 5V/3.3V
Throttle range calibration: Solidified and cannot be calibrated, (can be changed via DataLink software)
Black box function: Fault data + Log
Logging time: Default 2h (max 48h by changing Storage Interval)
Communication & digital throttle interface: CAN
Throttle source: PWM+CAN
CAN communication protocol: Cyphal (UAVCAN): HWCAN (factory default) + DroneCAN
CAN resistor: No termination resistor
CAN sampling point: 83.3%
CAN default baud rate: 500 kbps
Pinout of signal cable: Black←GND, White←Signal, Yellow←CAN GND, Gray←CAN High, Green←CAN Low

Motor
KV value: 45KV
Motor outer diameter: 167.1 mm
Depth of propeller mounting holes: 12mm

Propeller
Model: MSC 64x23
Weight: 1034±20 g
Installation dimensions: D60-6*M6, center hole diameter D20
Mounting screws/nuts &Tightening torque: M6*16, Torque 8N·m
Left hand nut: Torque 20N·m
Right hand nut: Torque 30N·m
Propeller material: Carbon fiber composite material

Model: MFC 63x24
Weight: 930±9 g
Installation dimensions: D46-4*M6, center hole diameter D15
Mounting screws/nuts &Tightening torque: M6*14, Torque 8N·m
Propeller material: Carbon fiber composite material

Propulsion System: H15MD-24S
Maximum single-axis takeoff weight: 60 kg (at sea level)
Maximum thrust: 145 kg（at sea level）
Rated voltage: 24S-92V / 28S-108V
Compatible lithium batteries: 24S~28S（LiPo）
Operating ambient temperature: -40~60 ℃
Recommended outer diameter of carbon tube (and wall thickness): 80mm+Wall thickness 3mm
Total weight (with cables，without propeller): 9900±200g
Ingress Protection level: IPX6
Efficiency of maximum single-axis takeoff weight: 7.4 g/W
Throttle source: PWM + CAN
Rated output power (Max continuous): 7000 W
Power cable specifications: 7AWG 2000±50 mm
Signal cable length: 2200±50 mm

ESC
Voltage range: 36~130 V
Continuous current: 110 A (non-enclosed environment temperature ＜35/40℃)
Peak current: 300 A (non-enclosed environment temperature ＜35/40℃) (3s)
PWM pulse width: 1100~1940 μs
PWM throttle frequency: 50~500 Hz
PWM signal level: 5V/3.3V
Throttle range calibration: Solidified and cannot be calibrated, (can be changed via DataLink software)
Black box function: Fault data + Log
Logging time: Default 2h (max 48h by changing Storage Interval)
Communication & digital throttle interface: CAN
Throttle source: PWM+CAN
CAN communication protocol: Cyphal (UAVCAN): HWCAN (factory default) + DroneCAN
CAN resistor: No termination resistor
CAN sampling point: 83.3%
CAN default baud rate: 500 kbps
Pinout of signal cable: Black←GND, White←Signal, Yellow←CAN GND, Gray←CAN High, Green←CAN Low

Motor
KV value: 35KV
Motor outer diameter: 167.1 mm
Depth of propeller mounting holes: 12mm

Propeller
Model: MSC 64x23
Weight: 1034±20 g
Installation dimensions: D60-6*M6, center hole diameter D20
Mounting screws/nuts &Tightening torque: M6*16, Torque 8N·m
Left hand nut: Torque 20N·m
Right hand nut: Torque 30N·m
Propeller material: Carbon fiber composite material

Model: MFC 63x24
Weight: 930±9 g
Installation dimensions: D46-4*M6, center hole diameter D15
Mounting screws/nuts &Tightening torque: M6*14, Torque 8N·m
Propeller material: Carbon fiber composite material

06 Thrust Test Data Table

69V Load performance parameters

Voltage(V)	Propeller	Throttle(%)	Thrust(g)	Current(A)	Input Power(W)	Efficiency(%)	Efficiency (g/W)	Output Power(W)	Temperature(℃)
69V (18S LiPo)	MSC 64x23	35%	25191	33.2	2289.4	80.46	11.0	1842.1	/
		37%	28405	39.4	2722.5	81.49	10.4	2218.6	
		39%	31893	46.6	3215.1	82.40	9.9	2649.2	
		41%	35618	54.6	3767.8	83.16	9.5	3133.3	
		43%	39555	63.5	4382.0	83.75	9.0	3669.9	
		45%	43682	73.3	5060.0	84.20	8.6	4260.5	
		47%	47985	84.1	5804.5	84.51	8.3	4905.4	
		49%	52456	95.8	6619.0	84.73	7.9	5608.3	
		51%	57087	108.7	7507.3	84.86	7.6	6370.7	
		53%	61875	122.7	8473.8	84.91	7.3	7195.1	
		55%	66815	137.9	9522.8	84.91	7.0	8085.8	
		57%	71902	154.3	10658.6	84.85	6.7	9043.8	
		59%	77131	172.1	11885.3	84.72	6.5	10069.3	
		61%	82490	191.2	13206.2	84.51	6.2	11160.6	
		63%	87966	211.7	14623.4	84.21	6.0	12314.4	
		65%	93538	233.7	16137.3	83.81	5.8	13524.6	
		67%	99177	256.9	17745.8	83.29	5.6	14780.5	
		69%	104847	281.5	19443.6	82.64	5.4	16068.2	
		71%	110501	307.3	21221.1	81.87	5.2	17373.7	
		80%	133896	428.3	29586.1	77.54	4.5	22941.0	
		85%	143049	483.3	33380.6	75.58	4.3	25229.1	
		100%	145997	502.2	34685.5	74.93	4.2	25989.9	

69V Load performance parameters

Voltage(V)	Propeller	Throttle(%)	Thrust(g)	Current(A)	Input Power(W)	Efficiency(%)	Efficiency (g/W)	Output Power(W)	Temperature(℃)
69V (18S LiPo)	MFC 63x24	33%	20328	25.4	1754.6	80.51	11.6	1412.7	/
		38%	27671	38.7	2672.0	84.21	10.4	2250.1	
		40%	30933	45.5	3141.8	84.86	9.8	2666.1	
		42%	34385	53.2	3673.0	85.28	9.4	3132.3	
		44%	38029	61.8	4268.5	85.58	8.9	3652.9	
		46%	41868	71.3	4928.2	85.81	8.5	4228.9	
		48%	45902	81.9	5654.2	86.01	8.1	4863.2	
		50%	50131	93.3	6447.9	86.18	7.8	5556.8	
		52%	54552	105.8	7312.5	86.34	7.5	6313.6	
		54%	59160	119.4	8249.3	86.48	7.2	7134.0	
		56%	63946	134.1	9262.2	86.57	6.9	8018.3	
		58%	68901	149.9	10356.6	86.60	6.7	8968.8	
		60%	74008	167.0	11537.3	86.55	6.4	9985.6	
		62%	79248	185.4	12810.7	86.40	6.2	11068.4	
		64%	84598	205.3	14181.4	86.14	6.0	12215.9	
		66%	90028	226.6	15653.0	85.75	5.8	13422.5	
		68%	95505	249.3	17225.5	85.25	5.5	14684.8	
		70%	100986	273.5	18894.0	84.63	5.3	15990.0	
		72%	106426	298.9	20647.5	83.92	5.2	17327.4	
		80%	126578	404.9	27975.9	80.58	4.5	22543.0	
		87%	139172	478.9	33083.7	78.17	4.2	25861.6	
		100%	142696	500.0	34547.1	77.48	4.1	26767.1	

92V Load performance parameters

Voltage(V)	Propeller	Throttle(%)	Thrust(g)	Current(A)	Input Power(W)	Efficiency(%)	Efficiency (g/W)	Output Power(W)	Temperature(℃)
92V (24S LiPo)	MSC 64x23	33%	18334	15.6	1434.2	78.83	12.8	1130.6	/
		38%	24935	23.9	2197.0	82.51	11.3	1812.7	
		42%	31294	33.1	3046.0	84.20	10.3	2564.7	
		44%	34803	38.7	3556.8	84.76	9.8	3014.7	
		46%	38529	44.9	4129.2	85.18	9.3	3517.2	
		48%	42474	51.8	4766.9	85.51	8.9	4076.1	
		50%	46643	59.5	5474.1	85.77	8.5	4695.1	
		52%	51041	68.0	6255.6	85.99	8.2	5379.2	
		54%	55674	77.3	7116.6	86.16	7.8	6131.7	
		56%	60544	87.6	8062.9	86.30	7.5	6958.3	
		58%	65650	98.9	9100.6	86.40	7.2	7862.9	
		60%	70987	111.2	10236.1	86.46	6.9	8850.2	
		62%	76544	124.7	11476.1	86.44	6.7	9919.9	
		64%	82302	139.4	12826.6	86.33	6.4	11073.2	
		66%	88234	155.3	14293.2	86.10	6.2	12306.4	
		68%	94302	172.6	15878.9	85.71	5.9	13609.8	
		70%	100459	191.1	17583.7	85.17	5.7	14976.0	
		72%	106643	210.8	19401.4	84.45	5.5	16384.5	
		76%	118776	253.3	23307.5	82.55	5.1	19240.3	
		80%	129906	297.0	27329.8	80.36	4.8	21962.2	
		85%	140730	344.4	31688.8	77.99	4.4	24714.1	
		100%	144500	362.2	33331.7	77.17	4.3	25722.1	

108V Load performance parameters

Voltage(V)	Propeller	Throttle(%)	Thrust(g)	Current(A)	Input Power(W)	Efficiency(%)	Efficiency (g/W)	Output Power(W)	Temperature(℃)
108V (28S LiPo)	MSC 64x23	33%	24912	20.6	2220.5	81.72	11.2	1814.6	/
		38%	33942	31.8	3431.8	84.57	9.9	2902.3	
		42%	42087	43.7	4726.1	85.38	8.9	4035.2	
		44%	46626	51.0	5509.8	85.61	8.5	4716.9	
		46%	51514	59.2	6395.0	85.78	8.1	5485.7	
		48%	56756	68.4	7387.6	85.92	7.7	6347.4	
		50%	62343	78.6	8491.8	86.04	7.3	7306.4	
		52%	68251	89.9	9711.5	86.11	7.0	8362.6	
		54%	74440	102.3	11050.7	86.12	6.7	9516.8	
		56%	80863	115.8	12514.4	86.03	6.5	10766.1	
		58%	87456	130.6	14108.2	85.82	6.2	12107.6	
		60%	94149	146.6	15836.9	85.44	5.9	13531.1	
		62%	100861	163.9	17702.2	84.86	5.7	15022.1	
		64%	107503	182.3	19698.8	84.07	5.5	16560.8	
		66%	113982	201.9	21810.2	83.07	5.2	18117.8	
		68%	120197	222.2	24005.7	81.87	5.0	19653.4	
		70%	126043	242.8	26236.9	80.52	4.8	21126.0	
		72%	131412	263.2	28437.9	79.10	4.6	22494.4	
		74%	136195	282.5	30526.7	77.67	4.5	23710.1	
		76%	140281	300.0	32409.7	76.34	4.3	24741.5	
		80%	145919	325.4	35162.5	74.33	4.1	26136.3	
		100%	147509	333.0	35979.8	73.75	4.1	26535.1	

92V Load performance parameters

Voltage(V)	Propeller	Throttle(%)	Thrust(g)	Current(A)	Input Power(W)	Efficiency(%)	Efficiency (g/W)	Output Power(W)	Temperature(℃)
92V (24S LiPo)	MFC 63x24	33%	16043	14.4	1326.2	80.27	12.1	1064.5	/
		38%	22145	22.2	2038.5	82.61	10.9	1684.0	
		42%	27949	30.4	2795.0	84.77	10.0	2369.3	
		44%	31158	35.3	3247.7	85.69	9.6	2783.0	
		46%	34577	40.8	3756.7	86.45	9.2	3247.6	
		48%	38211	47.0	4328.2	87.04	8.8	3767.2	
		50%	42068	54.0	4968.7	87.47	8.5	4346.1	
		52%	46150	61.8	5684.7	87.74	8.1	4987.7	
		54%	50464	70.4	6481.7	87.88	7.8	5696.1	
		56%	55009	80.0	7366.1	87.92	7.5	6476.3	
		58%	59785	90.6	8340.7	87.89	7.2	7330.6	
		60%	64785	102.3	9410.1	87.82	6.9	8263.9	
		62%	69999	114.9	10575.2	87.74	6.6	9278.7	
		64%	75410	128.6	11836.0	87.65	6.4	10374.2	
		66%	80997	143.3	13191.6	87.56	6.1	11550.5	
		68%	86729	159.1	14640.1	87.44	5.9	12801.3	
		70%	92568	175.8	16181.6	87.28	5.7	14123.3	
		72%	98466	193.6	17814.2	87.02	5.5	15502.0	
		76%	110202	232.0	21355.1	86.01	5.2	18367.5	
		80%	121346	274.0	25219.9	84.14	4.8	21220.0	
		85%	133223	327.8	30171.6	80.86	4.4	24396.8	
		100%	142372	378.4	34830.7	77.38	4.1	26952.0	

108V Load performance parameters

Voltage(V)	Propeller	Throttle(%)	Thrust(g)	Current(A)	Input Power(W)	Efficiency(%)	Efficiency (g/W)	Output Power(W)	Temperature(℃)
108V (28S LiPo)	MFC 63x24	33%	21935	18.8	2032.6	82.70	10.8	1680.9	/
		38%	30188	28.8	3110.4	85.90	9.7	2671.8	
		42%	37917	40.1	4327.6	86.73	8.8	3753.3	
		44%	42184	46.9	5064.1	86.97	8.3	4404.3	
		46%	46730	54.5	5887.1	87.18	7.9	5132.4	
		48%	51560	63.0	6800.8	87.37	7.6	5941.8	
		50%	56677	72.3	7807.3	87.55	7.3	6835.3	
		52%	62075	82.5	8912.2	87.70	7.0	7816.0	
		54%	67746	93.7	10121.8	87.80	6.7	8886.9	
		56%	73671	106.0	11443.7	87.82	6.4	10049.8	
		58%	79825	119.4	12890.9	87.73	6.2	11309.2	
		60%	86172	134.0	14476.3	87.50	6.0	12666.8	
		62%	92664	150.1	16212.3	87.10	5.7	14120.9	
		64%	99244	167.6	18103.6	86.52	5.5	15663.2	
		66%	105837	186.6	20150.3	85.76	5.3	17280.9	
		68%	112358	206.8	22338.6	84.82	5.0	18947.6	
		70%	118704	228.1	24632.8	83.72	4.8	20622.5	
		72%	124754	249.8	26977.7	82.48	4.6	22251.2	
		74%	130371	271.2	29295.0	81.16	4.5	23775.8	
		76%	135398	291.4	31475.9	79.83	4.3	25127.2	
		78%	139657	309.2	33401.9	78.58	4.2	26247.2	
		100%	142949	323.5	34941.2	77.52	4.1	27086.4	

The above data was measured by HOBBYWING Laboratory at room temperature 25°C, at sea level, with varying throttle input, for reference only.

07 Protection and Alarm Function Description

The ESC included in the propulsion system is specifically designed for industrial drones, without low voltage protection or over-temperature protection.

- Startup protection
  After the propulsion system is powered on, it enters power-on self-check mode. If the self-check is successful, it will emit a string of beeps before it can operate normally. If the self-check fails, the motor cannot be driven with LED flashing as a warning.
- Power-on abnormal voltage protection
  When the power-on voltage is lower than 36V or exceeds 80 V（18S）/130 V（24S）, it will warn of overvoltage or undervoltage through LED flashing and emitting beeps (refer to "Explanation of Motor Warning Beeps & LED Flashing, and Fault Troubleshooting"), and cannot pass the power-on self-check to operate normally. During flight, there is no abnormal voltage protection. It is necessary to always monitor the power supply voltage. . During flight, it is necessary to always monitor the power supply voltage. When the voltage drops below 36V , some electronic components may malfunction, potentially leading to a crash. Please land the aircraft immediately.
- Stall protection
  When a motor stall is detected by the ESC, the motor will attempt to restart 3 times . If the stall continues during this period, the ESC will completely shut down the output and no longer attempt to restart the motor. At this time, the propulsion system must be repowered and the fault must be resolved, before the fault LED flashing can be cleared and power output can be restored.
- Overcurrent protection
  When the instantaneous current is abnormal and exceeds 800 A for about 4μs, the ESC will turn off the output and continuously attempt to restart the motor. If multiple restarts fail, the propulsion system must be repowered to restore normal operation.
- Throttle signal lost protection
  When the ESC detects a loss of throttle signal for more than 30 ms, it maintains the throttle output at the last moment and triggers the throttle signal lost alarm. And if the loss exceeds 1s, the output will immediately shut down to prevent greater losses caused by the continued high-speed rotation of the propeller. After the signal is restored, the ESC will restore power output accordingly.
- Startup delay protection
  When the motor is started for the first time, there will be a delay of approx. 3s before the motor can reach full speed. During this period, regardless of how much persentage of throttle is received, the motor speed will not change. When used with a flight controller, the automatic delay of the flight controller needs to be adjusted. Otherwise, it may lead to issues such as catapult takeoff of the aircraft.For open-source Ardupilot, modify the MOT_SPOOL_TIME and TKOFF_SLEW_TIME to appropriate values to match the propulsion system delay time. For closed-source flight controller, please contact the manufacturer of flight controller.
- Over-temperature warning
  The motor & ESC have no temperature protection, when the MOSFET temperature exceeds 110℃ or the capacitor temperature exceeds than 100℃, the ESC LED will flash (refer to "Explanation of Motor Warning Beeps & LED Flashing, and Fault Troubleshooting") and send over-temperature fault information externally through the data interface, but the motor will not stop rotating or reduce output. When the motor and ESC continue to overheat, there is a risk of burnout. Please land the aircraft in time or reduce throttle output.
- Back EMF (Back Electromotive Force) protection
  During the process of reducing throttle, the motor & ESC will generate back electromotive force (EMF), the ESC will perform corresponding logical processing to prevent high-voltage back EMF from damaging internal components. The back EMF voltage limit threshold is 82 V（18S）/ 132V（24S）.

08 Explanation of Motor Warning Beeps & LED Flashing, and Fault Troubleshooting

Note: The LED light color of Hobbywing propulsion system is adjustable, and it does not indicate status information by light color, but represents the operating status through the flashing mode.

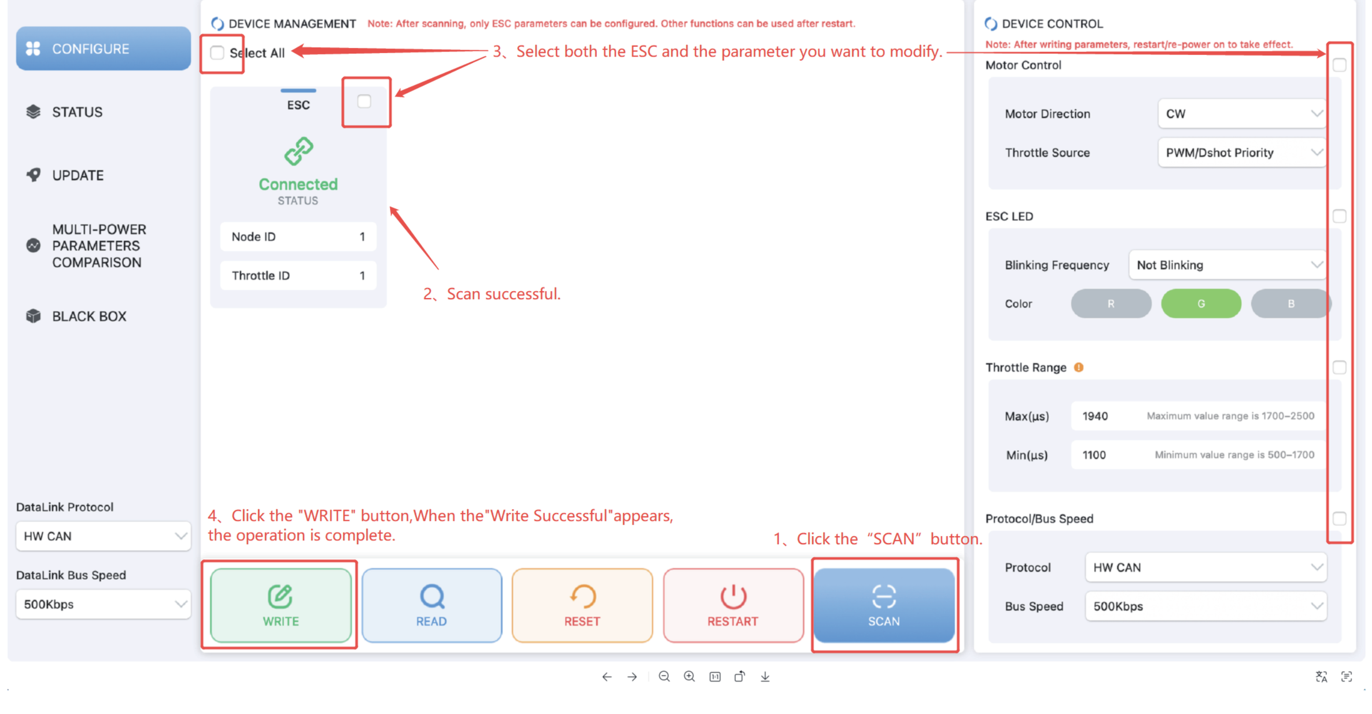
LED Status	Operating Situation	Motor Beeping Sound	Meaning	Possible Reasons	Solution
Steadily on (can be modified to 1Hz, 2Hz, 5Hz blinking via software)	Normal operation	Normal self-check beeping sound	Normal	\	\
Steadily on (can be modified to 1Hz, 2Hz, 5Hz blinking via software)	Normal operation, but motor emitting a "buzzing" sound after the throttle is down to zero and motor stops spinning	\	Running normally, no need to worry about it	· It is normal for the ESC & motor to continue running after stopping rotation, so there is no need to worry.	\
Continuous high-frequency quick flash	Normal operation	\	Operating under full throttle	\	\
1 short flash (periodically repeated)	The motor fails to start after powered-on	"Beep, beep", "Beep, beep", (each interval is approx. 1s)	Overvoltage	· Battery voltage is too high, power-on voltage is higher than 80 V（18S）/130 V（24S）	· Replace with a fully charged battery with the appropriate voltage
2 short flashes (periodically repeated)	The motor fails to start after powered-on	"Beep, beep", "Beep, beep", (each interval is approx. 1s)	Undervoltage	· Battery voltage is too low, power-on voltage is below 36V	· Replace with a fully charged battery with the appropriate voltage
3 short flashes (periodically repeated)	Motor stops in the air or restarts	\	Triggered overcurrent protection	· Use non-compatible model propellers or propellers not from Hobbywing, and replace motors with those from other manufacturers/models · If folding propellers are used, it is possible that the blades and propeller adapters are too loose and have lost their folding force, causing the blades to swing when the motor accelerates or decelerates · The motor experiences a slight stall but does not trigger the stall protection	· Please use the propellers of the original factory's matching model, and do not modify or replace them without permission · If using folding propellers, please tighten the blade mounting screws or replace the washer to restore the folding force between the blade and the propeller adapter · Check whether the propeller has hit any foreign objects and whether any foreign objects have entered the motor to cause the stall · After resolving the issue, repowering the propulsion system to restart operation and clear the fault LED flashing
1 long flash (periodically repeating)	The motor fails to start after powered-on	"Beep, beep, beep,..." (each interval is approx. 1s)	Throttle signal lost	· No valid throttle signal input · The throttle channel on receiver has no throttle signal output · The ESC throttle signal cable is not plugged into the corresponding motor control interface on the flight controller · Wiring harness connections and soldering have issues such as poor contact, loose connection, cold solder joint, detachment, etc. · Flight controller not working, throttle lock engaged, flight controller output range not match, flight controller output capacity insufficient, etc.	· Check if the transmitter and receiver are working properly together · Check if the ESC throttle signal cable is correctly plugged into the corresponding motor control interface on the flight controller · Check if the hardware wiring is reliable · Check whether the flight controller output signal, flight controller throttle lock settings; check if throttle output range of the flight controller/tansmitter match the PWM solidfied throttle range of the ESC · Check the resistance between the PWM throttle wires (black and white wires). If there is a short circuit, contact the seller for after-sales service
1 long flash + 1 short flash (periodically repeating)	The motor fails to start after powered-on	The rapid single tone of "beep beep beep..."	Throttle not returned to zero point	· Throttle is not at zero point when powering on	· Check if the percentage of throttle is 0% · Check whether the throttle output range of the flight controller /transmitter matches the PWM solidified throttle range of the ESC · If this LED status occurs during the motor rotation, please check the battery and circuit
1 long flash + 2 short flashes (periodically repeating)	Normal operation	\	MOSFET overtemperature (above 110℃)	· The installation location of the ESC affects heat dissipation · The sun is directly overhead at noon in summer or the temperature is too high · Single-axis takeoff weight exceeds the maximum single-axis takeoff weight · Use non-compatible model propellers or propellers not from Hobbywing · During bench testing, the thrust is greater than the maximum single-axis takeoff weight for an extended period of time	· Please land the aircraft in time or reduce throttle output to avoid burning out the motor/ESC · Wait for the propulsion system to cool down before powering it on again to resume operation · Please install the propulsion system correctly according to the installation diagram · When exposed to high temperatures and the sun is directly overhead at noon in summer, the flight load should be appropriately reduced compared to the maximum single-axis takeoff weight · Before each takeoff, please confirm that the single-axle takeoff weight does not exceed the maximum single-axle takeoff weight · Please use the propellers of the original factory's matching model, and do not modify or replace them without permission · During bench testing, please always pay attention to the thrust and throttle percentage. If MOSFET overheating occurs, the test should be stopped promptly and cooling measures should be taken
1 long flash + 3 short flashes (periodically repeating)	Normal operation	\	Capacitor overtemperature (above 100℃)	· Parameters in flight controller are not properly set, resulting in excessive oscillation in throttle output · Too many times performing rapid acceleration and deceleration during the test	· Please land the aircraft in time or reduce throttle output to avoid burning out the motor/ESC · Wait for the propulsion system to cool down before powering it on again to resume operation · Please correctly set the flight controller parameters · Avoid too many times of rapid acceleration and deceleration during the test
1 long flash + 4 short flashes (periodically repeating)	Motor stops in the air or restarts	\	Trigger stall protection	· Foreign objects entering the motor cause severe stuttering or jamming · After the aircraft accidentally crashed, the propeller hit the ground, resulting in severe stuttering or jamming	· Check whether the propeller has hit any foreign objects and whether any foreign objects have entered the motor to cause the stall · After resolving the issue, set the throttle to zero to restart operation, but repowering is needed to clear the fault LED flashing
2 long flashes (periodically repeating)	The motor fails to start after powered-on	No beeping sound during self-check	High-side open circuit	\	· Please check if the motor wiring is in good condition · If no issues are found, contact the seller for after-sales service
2 long flashes + 1 short flash (periodically repeating)	The motor fails to start after powered-on	No beeping sound during self-check	High-side short circuit	\	· Please check if the motor wiring is in good condition · If no issues are found, contact the seller for after-sales service
2 long flashes + 2 short flashes (periodically repeating)	After powered-on, the motor fails to startup & rotate normally, accompanied by "clicking" jitters	No beeping sound during self-check	Motor phase loss/ open circuit/IPC cable open circuit	\	· Check the connection of phase wires/IPC cable between the motor and ESC · Check if the motor is in good condition · If no issues are found, contact the seller for after-sales service
2 long flashes + 3 short flashes (periodically repeating)	The motor fails to start after powered-on	No beeping sound during self-check	Phase A Op Amp malfunction	\	· Normal operation can be restored by repowering · If this issue cannot be solved by repowering, contact the seller for after-sales service
2 long flashes + 4 short flashes (periodically repeating)	The motor fails to start after powered-on	No beeping sound during self-check	Phase B Op Amp malfunction	\	· Normal operation can be restored by repowering · If this issue cannot be solved by repowering, contact the seller for after-sales service
3 long flashes (periodically repeated)	The motor fails to start after powered-on	No beeping sound during self-check	Phase C Op Amp malfunction	\	· Normal operation can be restored by repowering · If this issue cannot be solved by repowering, contact the seller for after-sales service
\	The motor can rotate after powered-on	No beeping sound during self-check	Drive exception	\	· Contact the seller for after-sales service
\	Motor stops in the air or restarts	\	\	· The battery power is insufficient · Use non-compatible model propellers or propellers not from Hobbywing, and replace motors with those from other manufacturers/ models · If folding propellers are used, it is possible that the blades and propeller adapters are too loose and have lost their folding force, causing the blades to swing when the motor accelerates or decelerates · Power cables, motor wires, or signal cable have issues such as poor contact, loose connection, cold solder joint, disconnection, short circuit, etc. in connection or soldering · Motor stall · Throttle signal lost or interfered with · Strong electromagnetic radiation interference (such as radar, high-power antennas, base stations, etc.)	· Please use batteries with appropriate voltage and capacity. During flight, please monitor the battery level and land in time when the battery is low · Please use the propellers of the original factory's matching model, and do not modify or replace them without permission · If using folding propellers, please tighten the blade mounting screws or replace the washer to restore the folding force between the blade and the propeller adapter · Check the wiring of the propulsion system · Check whether the propeller has hit any foreign objects and whether any foreign objects have entered the motor to cause the stall · Check for poor contact, cold solder joints, or short circuits between the signal cables and the flight controller, check if the signal cables are too close to the power cables, use isolated power supply for the flight controller, use digital throttle, and check if the flight controller output is normal · Before takeoff, please check the surrounding electromagnetic environment to see if there is strong interference, and stay away from strong electromagnetic radiation sources · Contact the seller for after-sales service
\	During flight/testing, the motor/ESC smokes/ burns out (or capacitor explodes)	\	\	· The positive and negative power cables are connected reversedly · Excessive high voltage input · The power supply has no energy absorption capacity or insufficient energy absorption capacity. When quickly decreasing the throttle, excessive high Back EMF (Back Electromotive Force) will be generated, and excessive high voltage will burn out the ESC · Motor/ESC damage (wire insulation damage, exposed wiring, ESC water ingress, wrong wiring, motor foreign object ingress scratching the coil, etc.) · Single-axis takeoff weight exceeds the maximum single-axis takeoff weight · Use non-compatible model propellers or propellers not from Hobbywing · During bench testing, the thrust is greater than the maximum single-axis takeoff weight for an extended period of time · Parameters in flight controller are not properly set, resulting in excessive oscillation in throttle output · Abnormally intense vibration caused damage to the ESC components · Rapid acceleration when the temperature is too low (-30°C to -40°C) · Other situations (corrosion, bumps, etc.)	· Contact the seller for after-sales service

09 General Basic Function Settings

- Basic function settings can be accessed via two methods: computer (MAC/Windows) and mobile APP. This manual only covers the usage on the computer; for the usage on the mobile, please refer to the corresponding user guide, which will not be detailed here.
- This software platform only supports parameter configuration for ESCs with CAN communication; if the ESC uses UART communication, please contact Hobbywing technical support.
- Basic function parameters include: **setting Node ID and Throttle ID, changing motor direction, modifying throttle priority, changing LED color and blinking frequency, modifying throttle range, modifying ESC protocol and bus speed (bus rate)**, all of which can be set on this interface.
- This function requires the DataLinkBox G3 and DataLink V3 software. DataLink V3 software can be obtained from the Hobbywing official website, Hobbywing official technical support, or distributors.
- DataLinkBox G3 can be powered via USB-C or XT30, either method can be used. There is no need for duplicate power supply.
- If there are no other requirements, the ESC defaults to factory settings: Node ID is 1, Throttle ID is 1, CAN protocol is HW CAN, and bus rate is 500 Kbps;
- If there are multiple ESCs on one aircraft, then Node IDs and Throttle IDs of different ESCs on one aircraft must not be the same. Otherwise, when using the CAN function, multiple ESCs with the same Node ID or Throttle ID will be recognized as one ESC.

1) Wiring
Connect the computer and the DataLinkBox G3 via a USB-C data cable (or Bluetooth);
ESC ----> DataLinkBox G3: "Yellow Gray Green" ----> "- H L" of CAN1/CAN2 ports, "Black / White" ----> "- / S" of PWM port;

2) Operation
Run the DataLink V3 software, ensure that the ESC is connected and powered on → Click the "SCAN" button on the home page "CONFIGURE" → The ESC connected appears in the "DEVICE MANAGEMENT", indicating a successful scan → Select both the ESC and the parameters to be modified simultaneously → Click "WRITE", and a "Writing Completed" prompt pop-up window will appear → Power off all devices (power-off has no specific sequence and will not damage the devices).



- SCAN: This refers to scanning the currently connected ESC information via DataLinkBox G3. For multiple ESCs, they are distinguished by Node ID value. The scanned ESCs will flash cyclically in "red, green, blue" colors (if there are LEDs on the ESCs).
- READ: Read the selected ESC parameter data (only one ESC can be selected for reading).
- WRITE: After confirming the parameters to be changed, click "Write" to save them to the ESC. After modifying the parameters, click the "Read" button to confirm whether the parameters have been successfully written.
- RESET: Restore factory settings.
- RESTART: Which is software reset. The saved parameters will take effect after the software reset, with the effect equivalent to repowering.

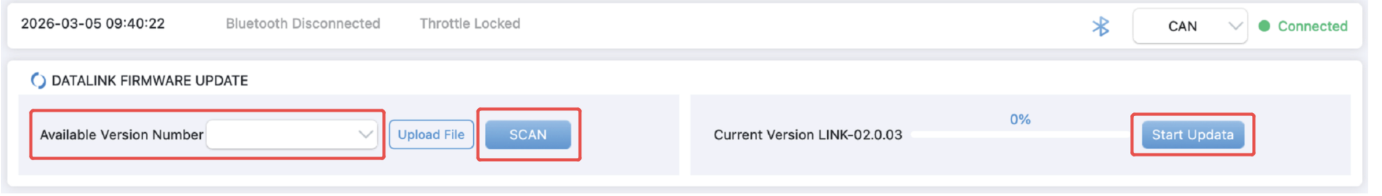
Caution: 1. Exercise caution when changing parameters, as incorrect settings may lead to the crash of your aircraft. If unsure, please contact Hobbywing's official technical support.
2. If the parameter writing fails, the reason may be ESC firmware restrictions that do not support writing. You can contact Hobbywing's official technical support.

10 Firmware Upgrade

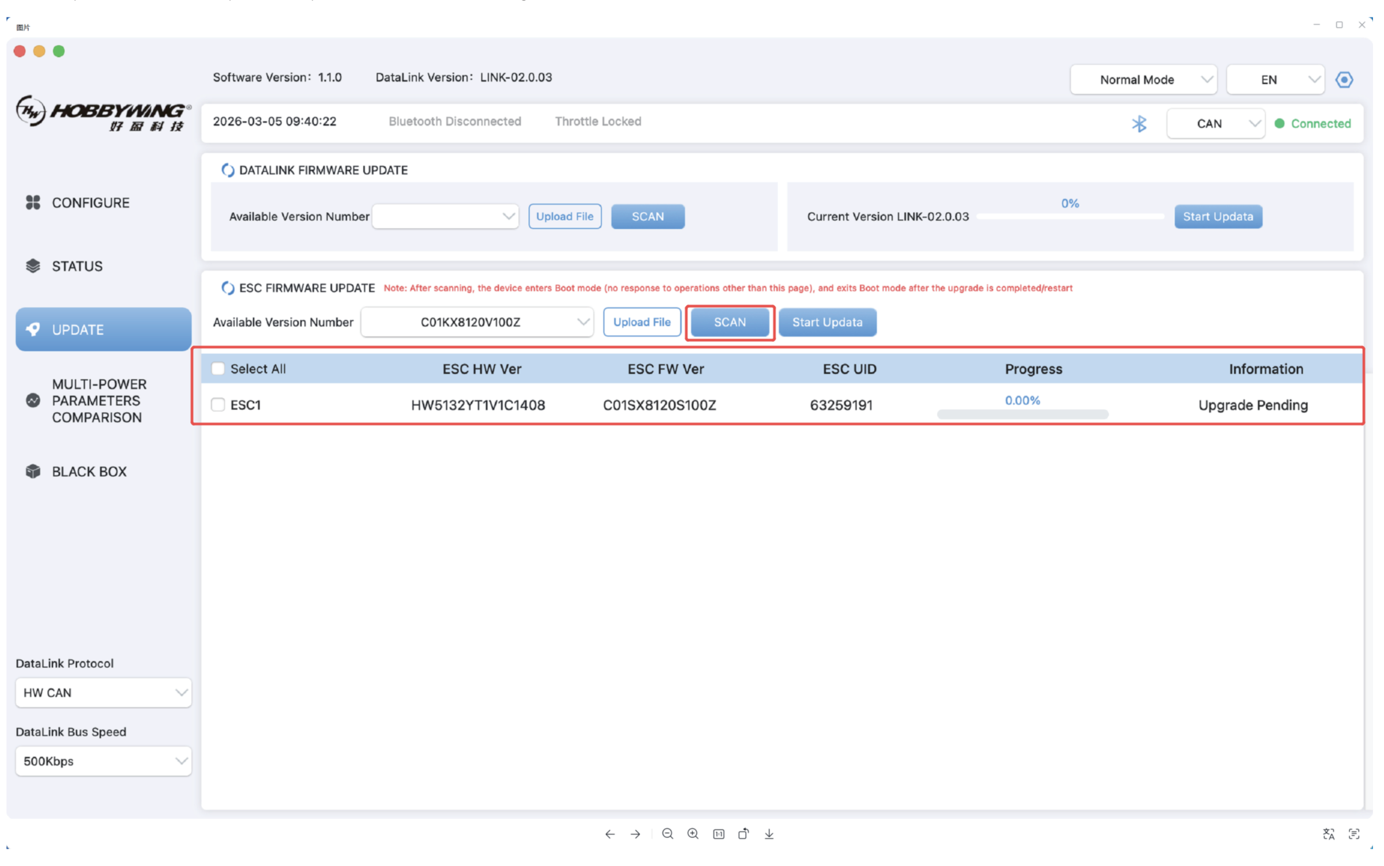
- Firmware upgrades can be performed through three methods: online upgrade via computer (MAC/Windows), online upgrade via mobile APP, and OTA upgrade via flight controller. This manual only covers the usage method for the computer, please refer to the corresponding user guide for the mobile device. Flight controller upgrade requires flight controller cooperation and is not detailed here.
- The computer supports multiple ESCs to be upgraded online simultaneously. This function requires the use of the DataLinkBox G3 and the DataLink V3 software package dedicated for upgrade.
- The DataLink V3 software can be obtained from the Hobbywing official website, Hobbywing official technical support, or distributors.
- For obtaining the firmware for upgrade, you can contact Hobbywing's official technical support.

1) Wiring
Connect the computer and the DataLinkBox G3 via a USB-C data cable (or Bluetooth);
ESC ----> DataLinkBox G3: "Yellow Gray Green" ----> "- H L" of CAN1/CAN2 ports, "Black / White" ----> "- / S" of PWM port;

2) The firmware of DataLinkBox G3 needs to be upgraded to the latest version
Run the DataLink V3 software, ensure that the ESC is connected and powered on → Click "Upgrade" to enter the page → Click "SCAN" in the "DATALINK FIRMWARE UPDATE" area, and the current version number will appear → Upload an available .db3 file, and the "Avalable Version Number" will appear → Click "Start Update" → After progress bar is full and showing "Upgrade succeeded", you can scan again to confirm whether it is already the latest version number.



3) ESC firmware upgrade
Click "SCAN" in the "ESC FIRMWARE UPDATE" area, then "ESC N (N is the ESC serial number)" appears → Click "Stop", then the ESC hardware version (ESC HW Ver), ESC firmware version (ESC FW Ver), and ESC UID will appear → Upload an available .db3 file, and the "Avalable Version Number" will appear → Click "Start Update" → After progress bar is full and showing "Upgrade succeeded", you can scan again to confirm whether the ESC FW Ver is already the latest version number → Power off all devices (power-off has no specific sequence and will not damage the devices).



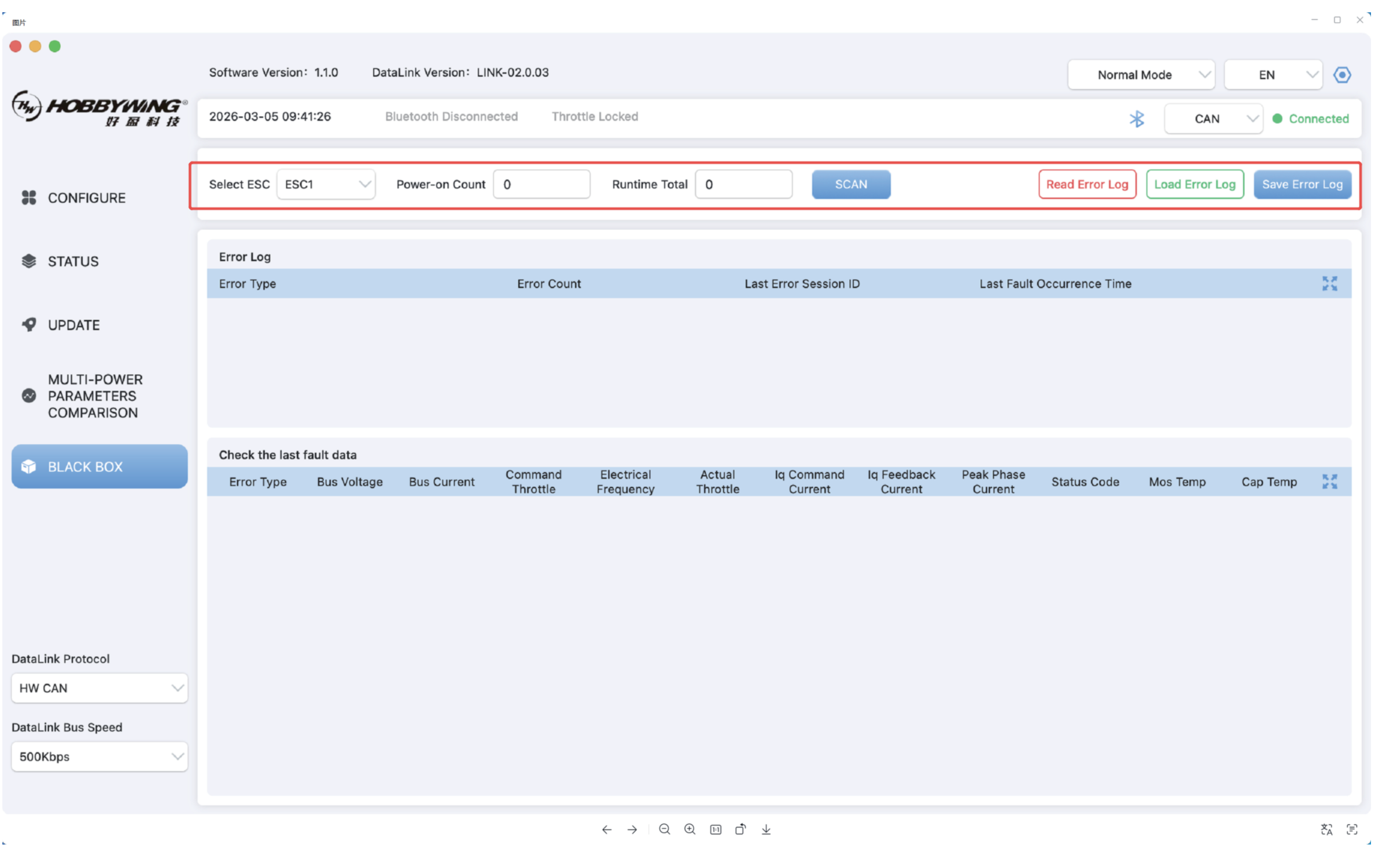
Notice:
1. After each scanning/upgrade of the ESC firmware version, the ESC must be repowred before performing other operations; otherwise, any subsequent operations before repowering will not respond!
2. Do not upgrade the DataLinkBox G3 firmware and ESC firmware simultaneously, otherwise there is a risk that the ESC firmware may be erased and become unusable!

11 Fault Data Reading

The ESC comes with a built-in black box function, which can store fault data such as power-on counts, fault counts, and fault types, facilitating the analysis of flight faults. This function requires the DataLinkBox G3 and DataLink V3 software. DataLink V3 software can be obtained from the Hobbywing official website, Hobbywing official technical support, or distributors.
DataLinkBox G3 can be powered via USB-C or XT30, either method can be used. There is no need for duplicate power supply.

1) Wiring
Connect the computer and the DataLinkBox G3 via a USB-C data cable (or Bluetooth);
ESC ----> DataLinkBox G3: "Yellow Gray Green" ----> "- H L" of CAN1/CAN2 ports, "Black / White" ----> "- / S" of PWM port;

2) Operation
Run the DataLink V3 software, ensure that the ESC is connected and powered on → Click "BLACK BOX" to enter the page → Click on "SCAN", when "ESC N (N is the ESC serial number)" appears, click "Stop" → Click on "Read Error Log" to view flight fault data → Save the fault data as needed → Power off all devices (power-off has no specific sequence and will not damage the devices).
You can also click "Load Error Log" to load historical fault data and view it on this page.

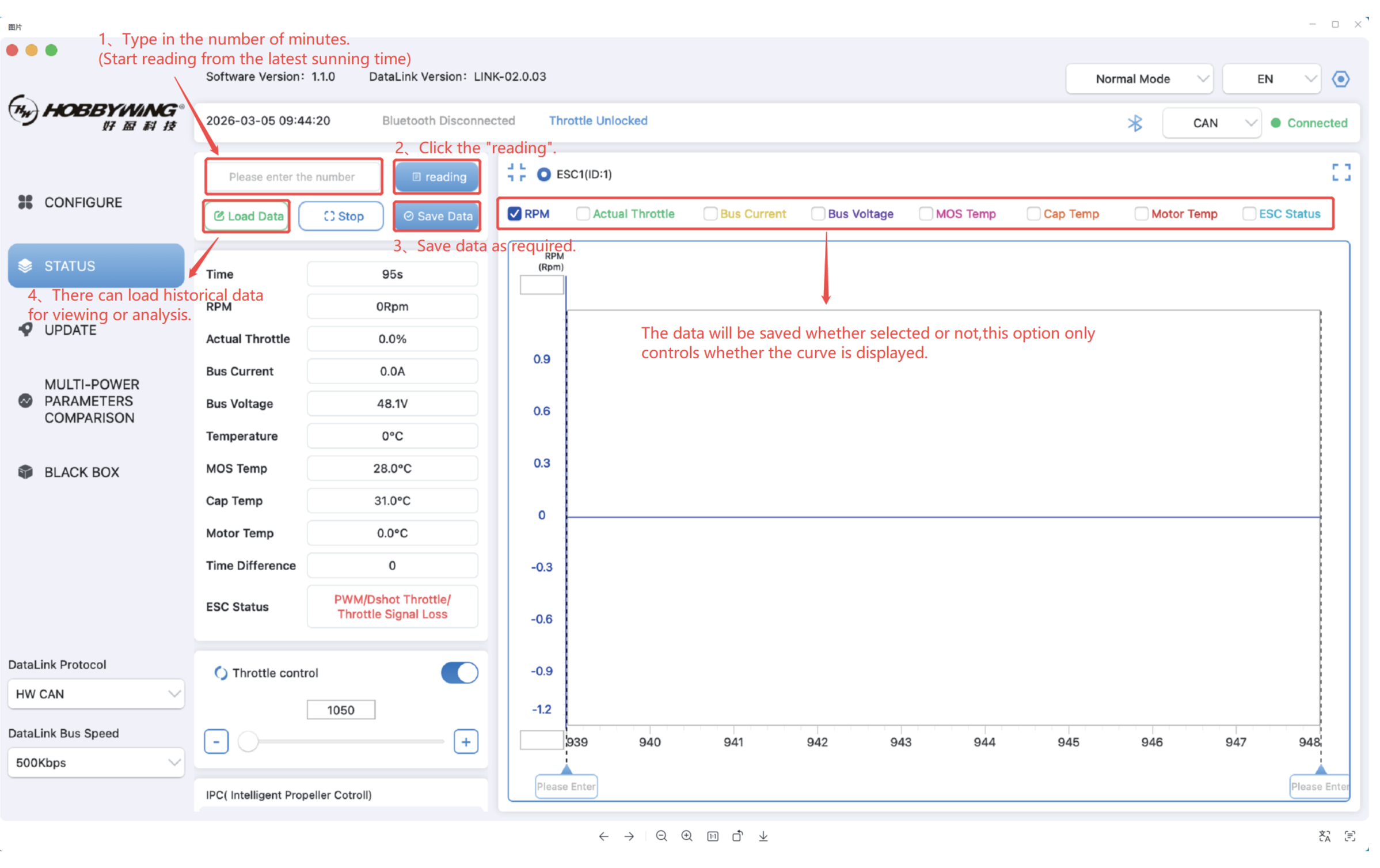


12 Log Reading

- The ESC comes with a built-in log function, which can record input throttle, RPM, ESC temperature , ESC status, etc. during flight, facilitating the analysis of flight data.
- This function requires the DataLinkBox G3 and DataLink V3 software. DataLink V3 software can be obtained from the Hobbywing official website, Hobbywing official technical support, or distributors.
- DataLinkBox G3 can be powered via USB-C or XT30, either method can be used. There is no need for duplicate power supply.

1) Wiring
Connect the computer and the DataLinkBox G3 via a USB-C data cable (or Bluetooth);
ESC ----> DataLinkBox G3: "Yellow Gray Green" ----> "- H L" of CAN1/CAN2 ports, "Black / White" ----> "- / S" of PWM port;

2) Operation
Run the DataLink V3 software, ensure the ESC is connected and powered on → Click "STATUS" to enter the page → Enter the number of minutes and click "reading" → The fluctuating data curve in the right graph indicates that reading is in progress → When the data curve stops fluctuating, it indicates that reading is completed. Save the data as needed → Power off all devices (power-off has no specific sequence and will not damage the devices)
You can also click "Load Data" to load historical log data and view it on this page.

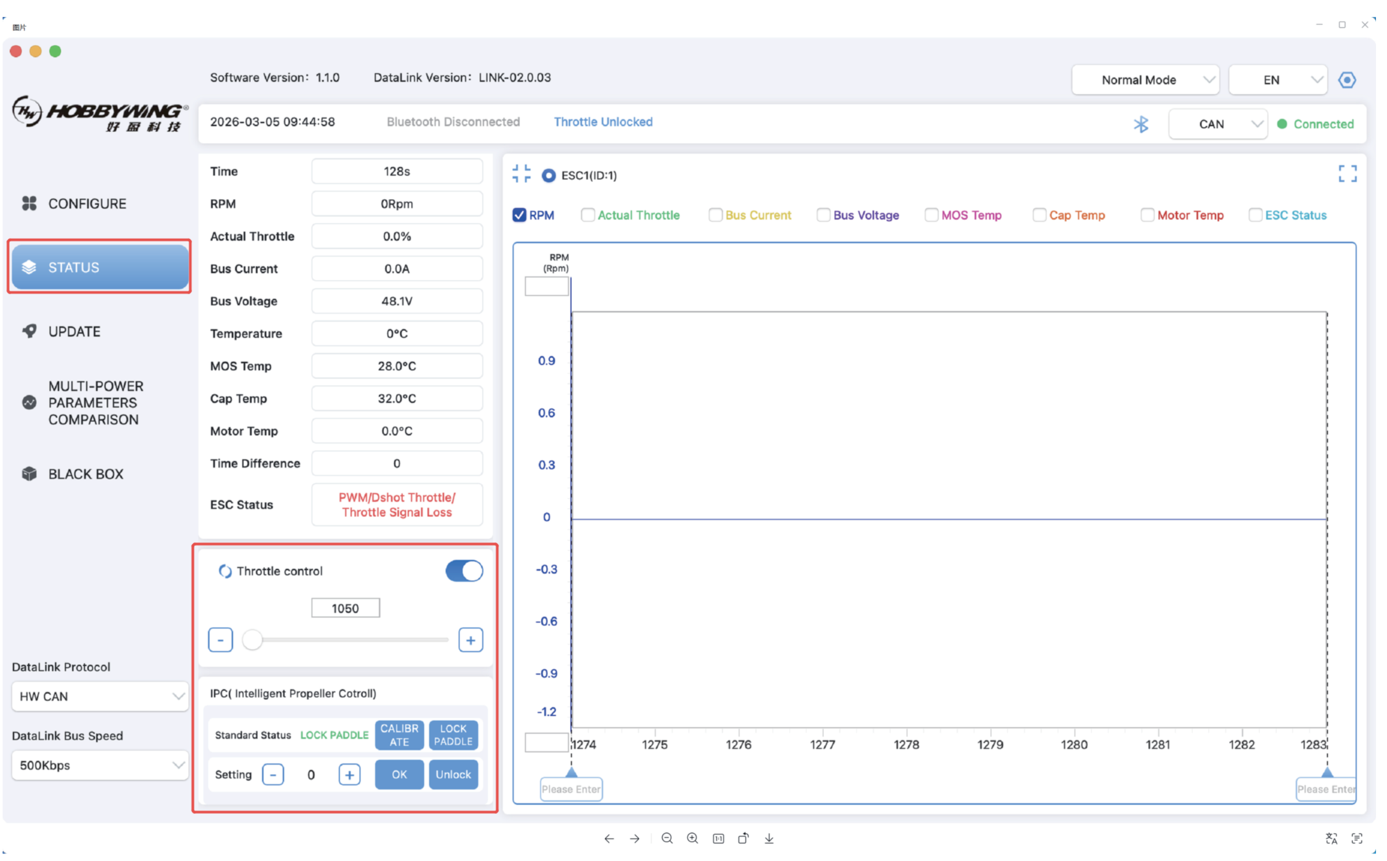


13 IPC (Intelligent Propeller Control) Function

- This ESC comes with the IPC (Intelligent Propeller Control) function. IPC calibration is required for the first use. If "Restore factory settings" operation is excuted, IPC calibration must also be redone.
- This function requires the DataLinkBox G3 and DataLink V3 software. DataLink V3 software can be obtained from the Hobbywing official website, Hobbywing official technical support, or distributors.
- DataLinkBox G3 can be powered via USB-C or XT30, either method can be used. There is no need for duplicate power supply.

1) Wiring
Connect the computer and the DataLinkBox G3 via a USB-C data cable (or Bluetooth);
ESC ----> DataLinkBox G3: "Yellow Gray Green" ----> "- H L" of CAN1/CAN2 ports, "Black / White" ----> "- / S" of PWM port;

2) Operation
- Run the DataLink V3 software and ensure that the ESC is connected and powered on.
- Method 1: Click "STATUS" to enter the page → Click "Read data", waiting for the status data to show up → Open the "Throttle control" button to activate throttle control → Manually turn the motor to the target angle → Click "CALIBRATE", and the motor will start rotating → The motor stops at the target angle, and IPC calibration is completed (the motor cannot be turned manually at this time) .
- Method 2: Click "STATUS" to enter the page → Click "Read data", waiting for the status data to show up → Open the "Throttle control" button to activate throttle control → Enter the target angle value in the "Settings" column to precisely positioning the target angle, then click "OK" → Click "CALIBRATE", and the motor will start rotating → The motor stops at the target angle, and IPC calibration is completed (the motor cannot be turned manually at this time).
- After completed IPC calibration, click the "Unlock" button to temporarily quit IPC status and can manually turn the motor. Click "Lock Paddle" button to resume to IPC status (the motor cannot be turned manually at this time).
- Power off all devices (power-off has no specific sequence and will not damage the devices).



14 Maintenance and After-sales Repair

During daily use and storage, equipment may experience wear, aging, and malfunctions. Regular maintenance can ensure that the equipment is put into operation in the next cycle in optimal condition, reducing the probability of malfunctions and improving operational efficiency.

Before Flight:
- For drones that are used for the first time or have not been used for a long time, after removing the propellers, use the flight controller's motor rotation direction check/motor test function to confirm if the position of the rotating motor corresponds to the selected frame type in the flight controller, and ensure the rotation direction is consistent with the frame type specifications. When the motor is running, check if the motor rotation has any up-and-down wobble (visual inspection).
- Before installing the propellers on the aircraft, please carefully inspect the blades for cracks and nicks. For blades made of carbon fiber reinforced nylon composite (carbon plastic), cracks and nicks smaller than 1mm do not affect actual use; if they are larger, please replace them immediately. For blades made of carbon fiber composite (carbon fiber), cracks and nicks smaller than 0.5mm do not affect actual flight; if they are larger, please replace them immediately.
- If using folding propellers, please unfold the blades to 180 degrees fully extended before takeoff. During the unfolding process, check the tightness between the blades and the propeller adapter. If they are loose, use an Allen wrench to tighten the assembling screws of the folding propeller until a certain folding force is restored between the blades and the propeller adapter. If the washer is worn, please replace it promptly to restore the folding force.
- When installing the propellers, please check whether the installation of the propellers and motors is correct, and whether the propeller rotation direction matches the motor rotation direction. After completing the installation of the propellers, conduct another check before each flight using the motor rotation direction check/motor test function of the flight controller to ensure that the motor rotation direction and propeller installation are correct. If there are any abnormalities, please correct them immediately.
- Before each flight, manually rotate the motor to check for any jamming or abnormal noise. Ensure the motor runs smoothly without abnormal vibration or noise. Prioritize checking whether the screws of the motor, propellers, and arms are securely installed. If there are folding propellers/foldable arms, check whether the folding propellers and foldable arms are fully extended and whether the foldable arms are locked. During the inspection, shake the relevant parts by hand, and if any looseness is found, tighten them promptly. If these parts are not securely fastened, flight safety will be affected, so be sure to check carefully! If any components are found to be aged or damaged, replace them promptly.

During Flight:
- During flight, if any abnormal conditions are detected (such as unstable attitude, ESC LED flashing, abnormal RPM, any fault reported via CAN communication, abnormal noise, etc.), please immediately land the aircraft and conduct an inspection.
- Please use the motor according to its recommended application environment. For example, do not use the light version (open-frame) motor in high dust and high salt fog working environments. Pay attention to whether the ambient temperature is too high or too low.

After Flight:
- After each day's flight, power off the drone and wait for the motors and ESC to return to normal temperature before cleaning. Do not clean the aircraft that are powered on or have just finished flying! It is recommended to use an air pump dust blower gun aimed at the bottom of the motor and the motor cooling vents, or areas where the motor enameled wire can be directly blown, and blow from multiple angles to significantly reduce the probability of dust accumulation inside the motor. In addition, the motor itself has good waterproof performance and can operate normally and be cleaned under low-pressure running water. However, it should be noted that after the cleaning is completed, please drain the internal water by running the motors or shaking them. Some motors have laser-printed labels. Due to the material, after cleaning, promptly wipe off water stains on the motor surface with an anti-static non-woven cloth to prevent rusting. After cleaning out foreign objects and water stains, it is recommended to wrap the motor with an anti-static bag (or box) to prevent magnetic impurities.
- For drones after flight or long-term storage, if there is dust, dirt, etc. on the propellers and motors, wipe them off with a damp cloth.
- It is recommended to conduct a thorough inspection and maintenance of the motor after every 10 hours of flight or one month of long-term storage, including: checking whether the motor rotation has any up-and-down wobble (visual inspection); whether the three-phase wires are firmly connected to the ESC; whether there are any broken enameled wires; whether the mounting screws of the mounting base and propellers are loose; whether the blades are damaged, etc.
- It is recommended to return to the factory for maintenance once every 500 hours of flight to prevent issues that are not easily detected during routine maintenance.

Storage & Maintenance:
- Please store the propulsion system in a dry (humidity < 85%), dust-free, and confined space.
- Please avoid high-temperature environments. It is recommended to store at a temperature between -10°C and 35°C to extend the service life of the propulsion system.
- Propeller storage shall follow the above temperature and humidity conditions of the propulsion system, and propeller adapter and screws (if it is folding propeller) should be sealed for storage if possible.
- If the motor will not be used for an extended period, apply a small amount of rust inhibitor (oil) to the rotor surface.
- Propulsion systems should be stored in their original packaging whenever possible.

Resources & Specifications

Visit www.hobbywing.com/en/products/h15md for more details about H15MD Industry Drone Integrated Coaxial Propulsion System