

X58

Tethered Drone Lighting System

User manual

V1.1.0

2022.3



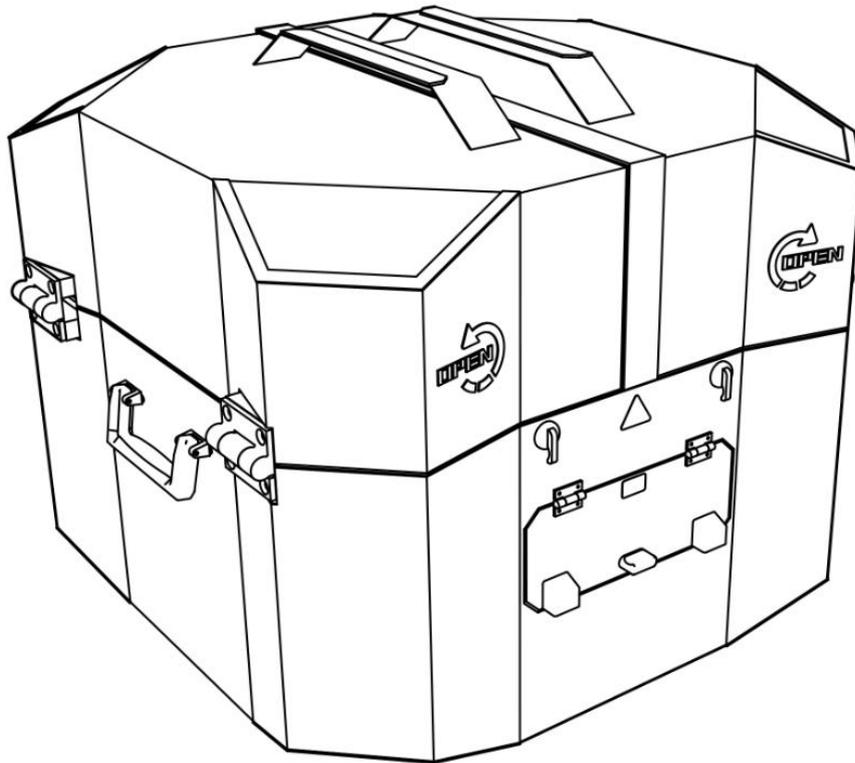
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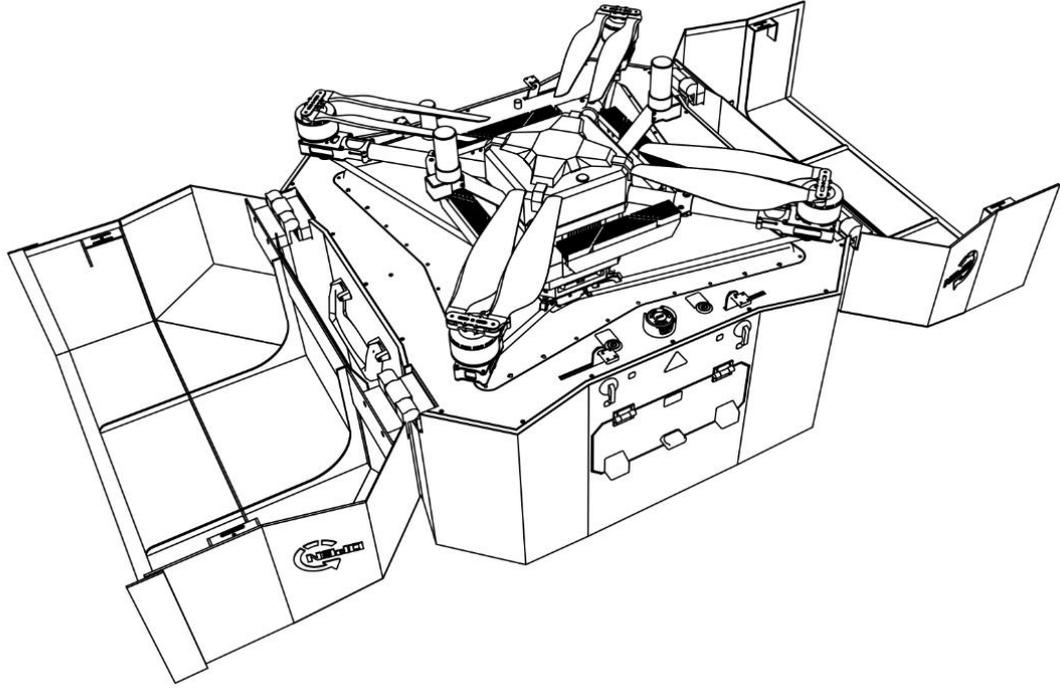
1. Introduction to tethered drone lighting system

The tethered drone lighting system provides long-term emergency lighting at night, including the UAV system and the ground system. The UAV is connected to the ground station through a tethered cable, and the ground station provides uninterrupted power supply for the UAV, enabling the UAV to stay in the air for a long time.

The tethered drone has a positioning system, which can achieve one-button autonomous landing, automatically identify the position of the ground station, and accurately land in the ground station. With RTK differential positioning system, it can keep the aircraft position stable for a long time. The remote control has the function of releasing the joysticks and returning to the center, which reduces the difficulty of operation and reduces the requirements of operators.

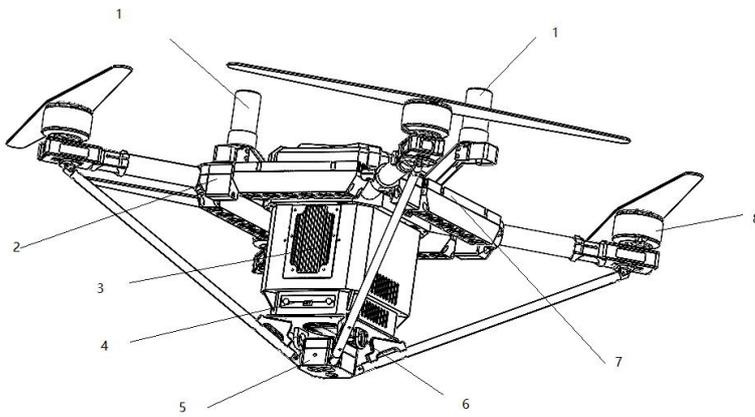


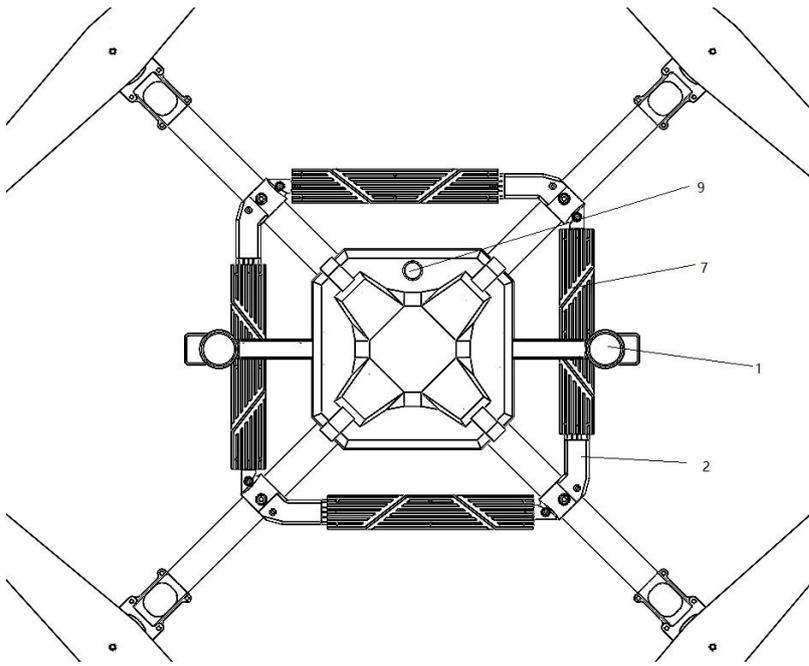
The tethered ground station contains an intelligent winch system that can automatically release and recover cables according to the aircraft height. The torque of the winch is adjustable, making it easy to apply in a variety of environments. With a tethered power detection system, the working status of the power supply can be checked in real time. The built-in RTK base station provides centimeter-level positioning for the aircraft together with the airborne RTK. Equipped with a vision system target to provide precise guidance when the aircraft is automatically landed.



2. System composition

The composition of the equipment is described as follows:





Tethered Drone Lighting System

1. Airborne RTK antennas
2. Lamp group rotation mechanism
3. Aircraft built-in battery
4. Airborne buck module
5. Vision system
6. Tethered Line Hook
7. Lighting lamps
8. UAV power system
9. Aircraft power switch

Product specification				Version	A / 0
Product name	Tethered drone lighting platform	Product model	X58	First page	
Specification	Rated input voltage	200~240VAC			
	Lighting power	720W			
	Illuminating brightness	108000Lm			
	Overall power	4KW			
	Generator effective power (recommended)	4KW			
	Aircraft maximum power	3KW			

	Maximum flight altitude	30m
	Takeoff weight	3.8Kg
	Aircraft backup battery capacity	2000mAh
	Drone back up battery life	4 minutes@ full power; 3 minutes@60% power
	Maximum lighting area	6500 m ²
	Waterproof level(aircraft)	IPX3 (Rainproof type, rainfall within 60 degrees from the vertical direction has no harmful effect)
	Waterproof level(base station)	IPX3(Rainproof type, rainfall within 60 degrees from the vertical direction has no harmful effect)
	Aircraft RTK accuracy	≤10CM
	Aircraft landing accuracy	≤8CM
	Power supply voltage of ground station (DC)	400V
	Motor	4216KV370
	Propeller	1652(16"paddle blade)
	Propeller wheelbase	610mm
	Remote control effective control distance	1km (point-to-point, LOS condition)
	Aircraft working time	Not less than 8 hours
	Overall dimension (mm)	605*577*518
	Overall weight(kg)	26.8kg (aircraft: 3.8Kg; ground station: 22.4Kg)
Environment requirement	Wind resistance	Level 3 (6m/s)
	Rain resistance	Light rain (rain can make the ground wet but not muddy, moderate rain level to be tested)
Features	Four groups of rotatable lamp (the maximum adjustable angle is 45 °)	
	No need to disassemble the smart BMS battery	
	Hand pull 180 ° rotary double doors	

3. UAV system

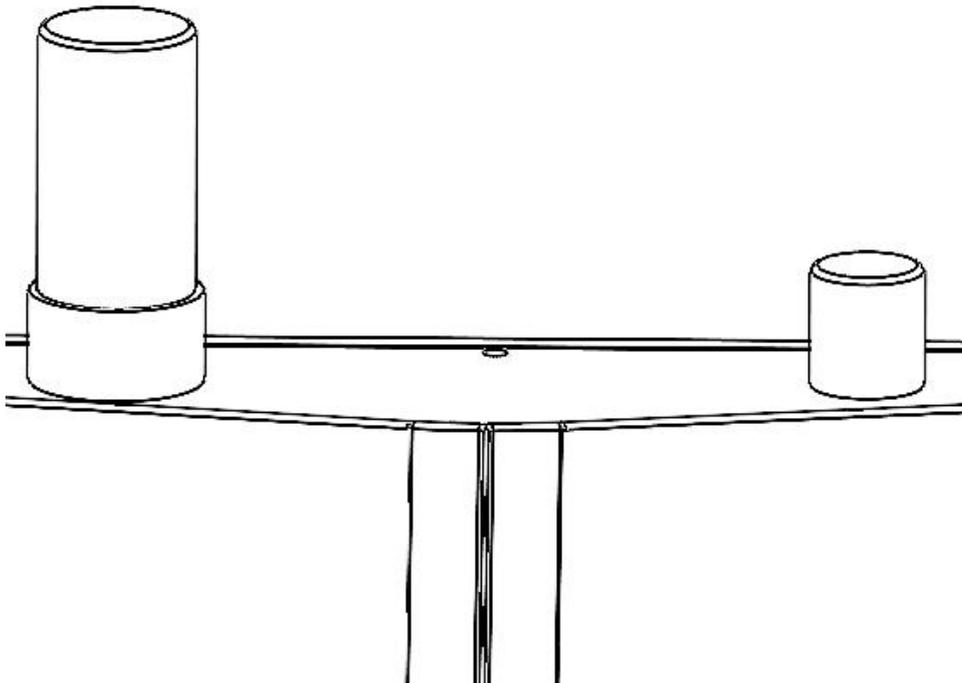
3.1 Overview

The UAV system is mainly composed of flight control system, positioning system, power system, lighting system, vision system, remote control and backup battery.

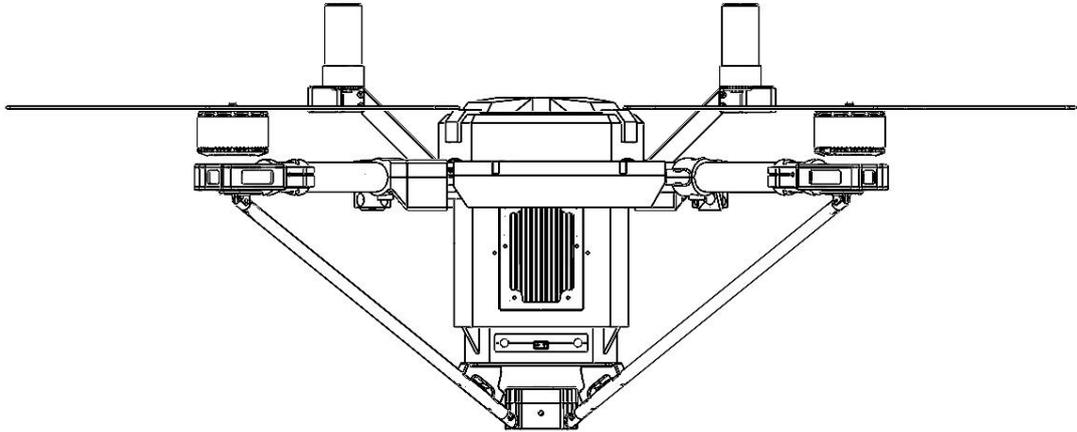
3.2 GPS

The positioning system consists of RTK base stations and airborne RTK mobile stations, which provide high-precision positioning information for UAVs.

The ground station has a built-in RTK base station, and the RTK base station runs automatically when the ground station is powered on, providing real-time calibration for the airborne RTK. Support three-mode positioning systems of Beidou, GPS, GLONASS .

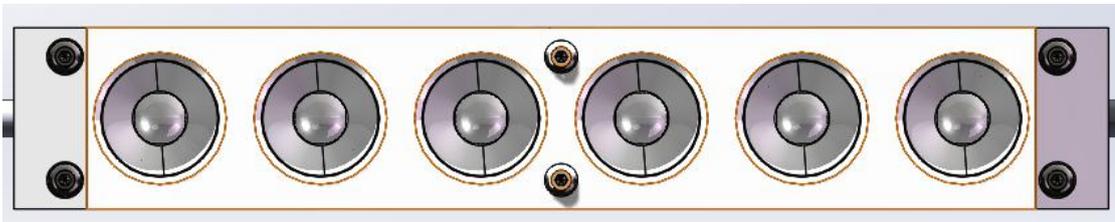


The airborne RTK is equipped with dual antennas to provide precise positioning information and stable heading information.

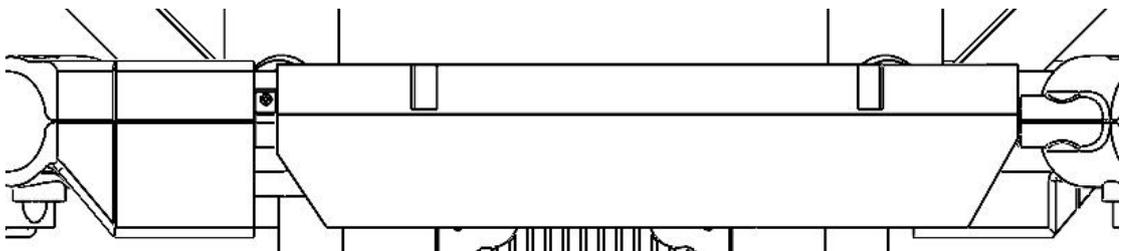


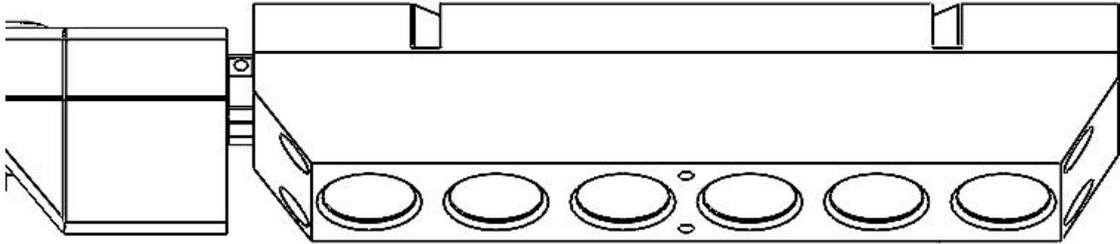
3.3 Lighting system

The lighting system is composed of four light groups, each group is composed of 6 high-brightness LED lights, a total of 24 LED lights. The maximum power of the lamp group is 720W, the brightness is 108000 Lumens, and the effective lighting area is 6500 m².



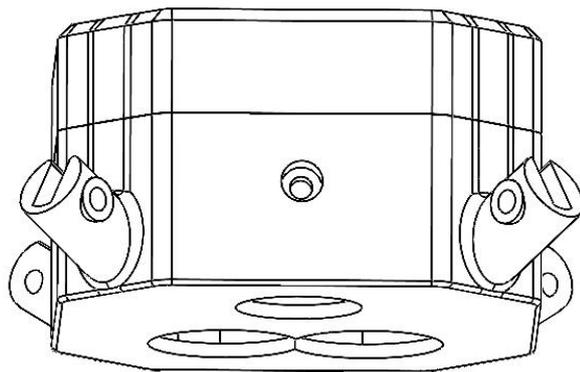
The angle of the light group can be adjusted in time through the controller knob, the adjustment range: vertical to 45°inclined.





3.4 Visual system

The tethered UAV is equipped with a downward vision system and infrared ranging, which provides accurate 3D positioning for drones.



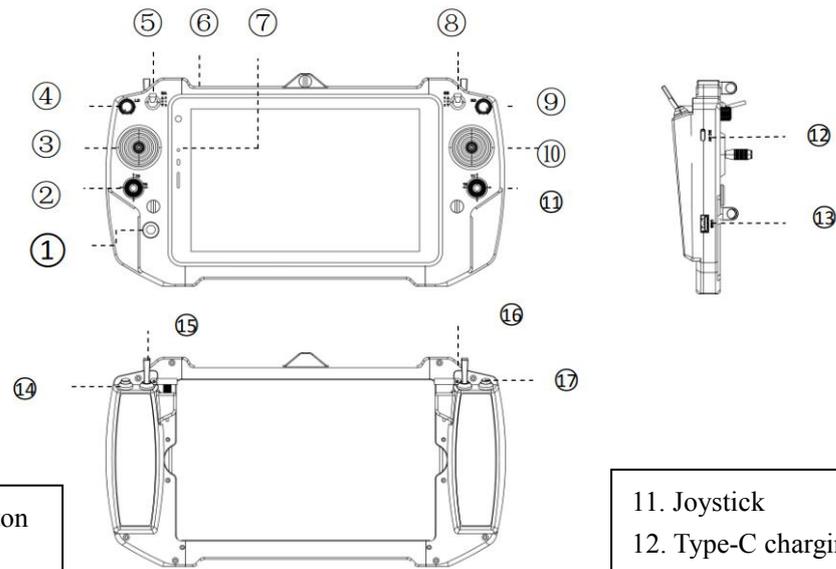
The vision system has the function of quickly and accurately locating the position of the ground station. The aircraft is enabled in the one-button landing mode. During the landing process, ensure that the aircraft is aligned with the position of the chassis, and ensure that the aircraft lands in the chassis.

Infrared ranging, equipped with optimally designed transmitting and receiving optical lenses, suitable for high-precision, long-distance ranging. Different from the traditional technology, its measurement accuracy is not affected by the color and reflectivity of the measurement target. The highest measurement distance can reach 32M.

3.5 Multi-function remote Control

T21 is an all-in-one handheld ground control station that integrates remote control, data link and GCS. T21 works in the 906-920MHZ frequency band and can provide stable data

transmission over a distance of up to 30KM. It is widely used in the field of unmanned device control and data transmission domains.



- 1. Remote control power button
- 2. Joystick
- 3. Throttle, course rocker
- 4. Lamp group control knob 1
- 5. Switch
- 6. Tablet PC Power Button
- 7. Tablet charging indicator
- 8. Flight mode switch
- 9. Lamp group control knob 2
- 10. Pitch, lift rocker

- 11. Joystick
- 12. Type-C charging port
- 13. Standard USB interface
- 14. Button
- 15. Switch
- 16. Lamp group brightness adjustment switch
- 17. Button

3.6 Flight mode switch

Three modes, hold mode, fixed-point mode and return-to-home mode.

Hold mode application scenario: During normal flight, before turning off the remote controller, turn the mode switch to the highest position to enter the hold mode. At this time, the aircraft maintains the current position and the main joystick control is invalid. The remote control can be turned off at this time.

Fixed-point mode application scenario: manual takeoff is unlocked; the aircraft is manually controlled and the aircraft is manually landed.

Return-to-home mode application scenario: When this mode is turned on, the aircraft will automatically perform a precise landing, the vision system will be activated, the aircraft will automatically find the position of the ground station, automatically land in the ground station, and automatically lock and stop the propellers.

Note: Be sure to keep the mode switch in hold mode before turning on the remote control during the flight. Otherwise, the aircraft may be displaced!

3.7 Light switch

Three working states of the light group, off, half on, fully on.

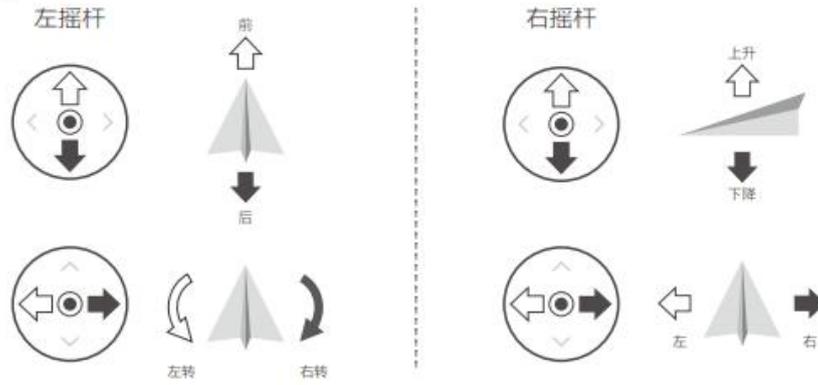
Off, the light group is turned off, and the light group only maintains the brightness of the breathing light when the aircraft is not unlocked.

Half-on, the light group runs at half power. It is invalid when the aircraft is not unlocked, and the light group maintains the brightness of the breathing light; after unlocking, the light group operates at half power.

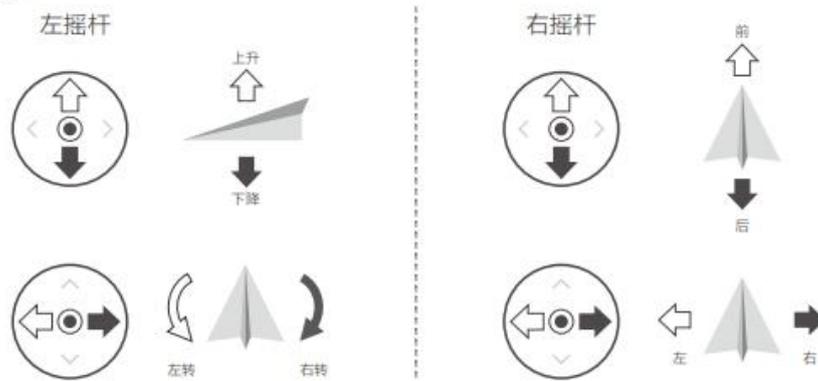
When fully turned on, the light group runs at full power. It is invalid when the aircraft is not unlocked, and the light group maintains the brightness of the breathing light; after unlocking, the light group runs at full power.

Remote control operation mode: take Japanese hands, American hands and Chinese hands as examples, as shown in the figure below:

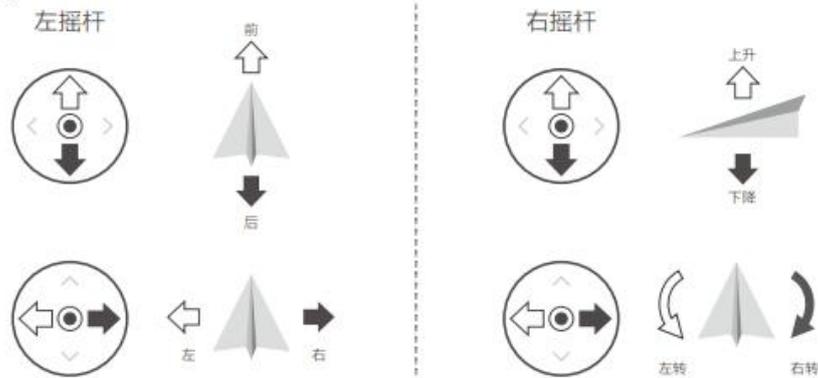
日本手 (Mode 1)



美国手 (Mode 2)



中国手 (Mode 3)

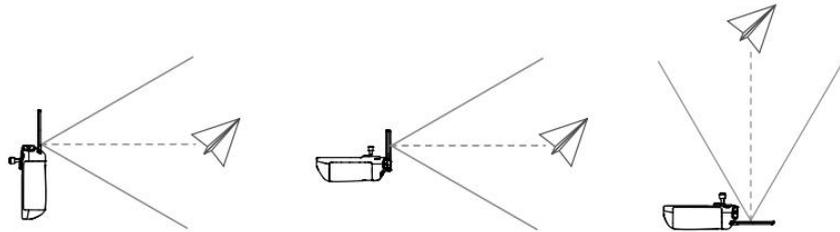


Note:

Default: American mode (mode2). Other joystick modes need to be mentioned by the user in advance and will be well configured at the factory.

The joystick mode is not limited to these three modes, and can match any user's operating habits.

When operating the drone, timely adjust the azimuth and distance between the remote control antenna and the aircraft to ensure the best communication. The adjustment is shown in the figure below:

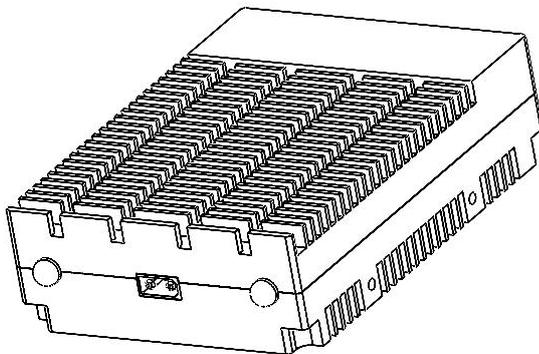


Note: Do not use other communication devices of the same frequency band at the same time, so as not to interfere with the remote control signal.

The remote control battery can work continuously for no less than 3.5 hours when fully charged. Store for a long time, pay attention to check the RC power.

3.8 Airborne Buck Converter

The airborne step-down module converts the ground high-voltage power supply into 24V for aircraft. The maximum power is 3000W, and the maximum input voltage is 410V. With multiple protection functions, over voltage protection, over temperature protection, short circuit protection, etc. It can work continuously for not less than 24 hours.



4. Tethered Ground Station System

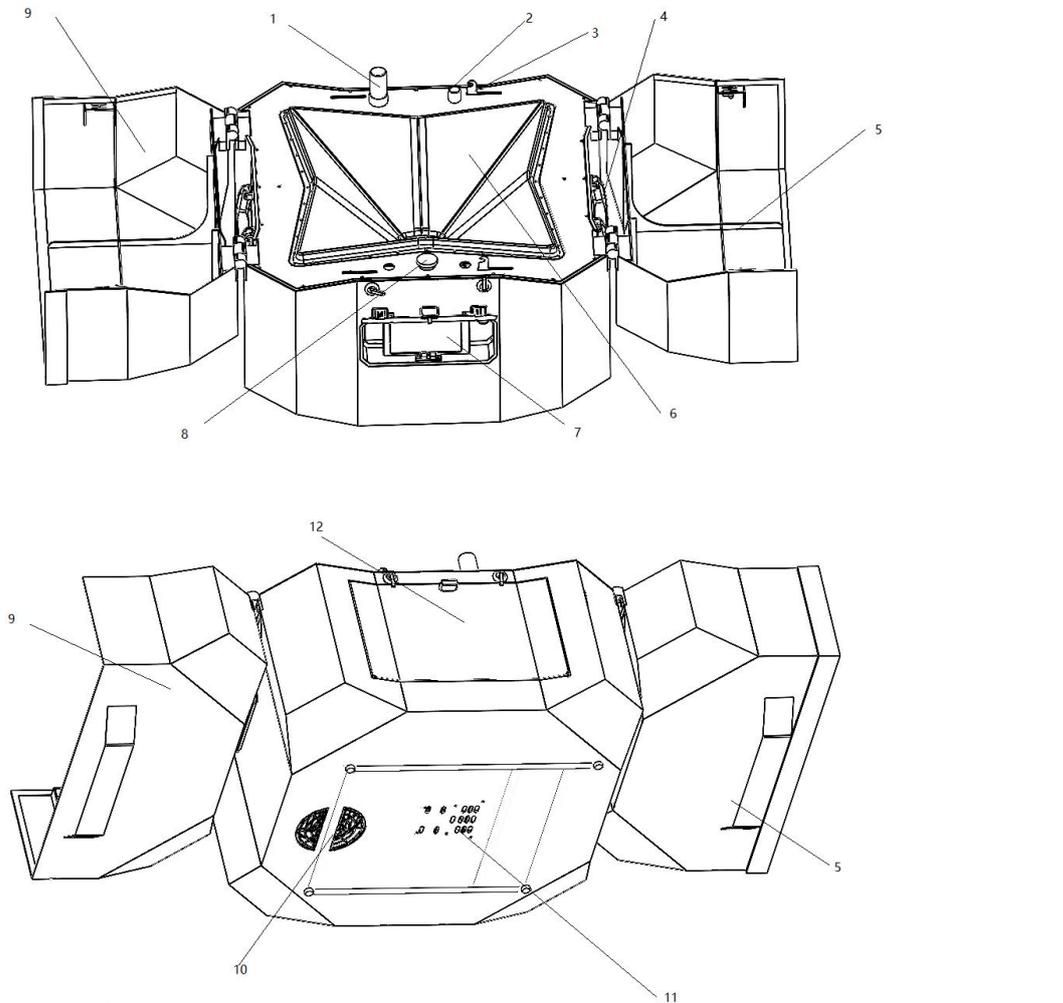
4.1 Introduction

The tethered ground station includes the automatic cable retraction system, the ground

high-voltage power supply system, the aircraft backup battery charger, the remote control battery charger, the control screen, etc.

Part Name:

Tethered ground station composition



- | | |
|-------------------------------|-----------------------------------|
| 1. Base station RTK antennas | 7. Ground Station control screen |
| 2. Data link antenna | 8. Ground Station control buttons |
| 3. Ground station lock buckle | 9. Left cabin door |
| 4. Carrying handle | 10. Heat dissipation holes |
| 5. Right cabin door | 11. Drainage holes |
| 6. Drone cabin | |

4.2 Cable automatic retraction system

It includes 32m tethered cable and winch.

The tethered cable has excellent characteristics such as repeatable retractable , small size, light weight, aging resistance, high mechanical strength, chemical resistance and easy to use, and the maximum allowed current is 7A.

The winch can automatically adjust the cable retraction according to the flight status of the

aircraft, and the cable tension can be adjusted through the GS screen.

4.3 Ground high voltage power supply system

The input AC 220V, the output DC 400V, the rated power is 3500W, and the maximum power is 4000W. It has a power compensation function, which can ensure that the airborne terminal will not cause excessive voltage drop with the increase of power, and ensure the stable power supply of the aircraft.

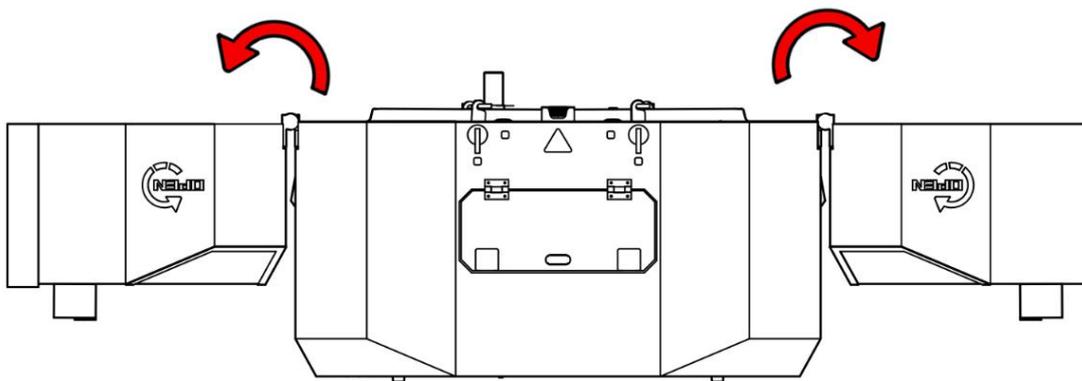
4.4 Ground station control screen

It is used to adjust the control strength of the winch. Start the winch, and cable length, ground output voltage, current, power and other data will be shown.

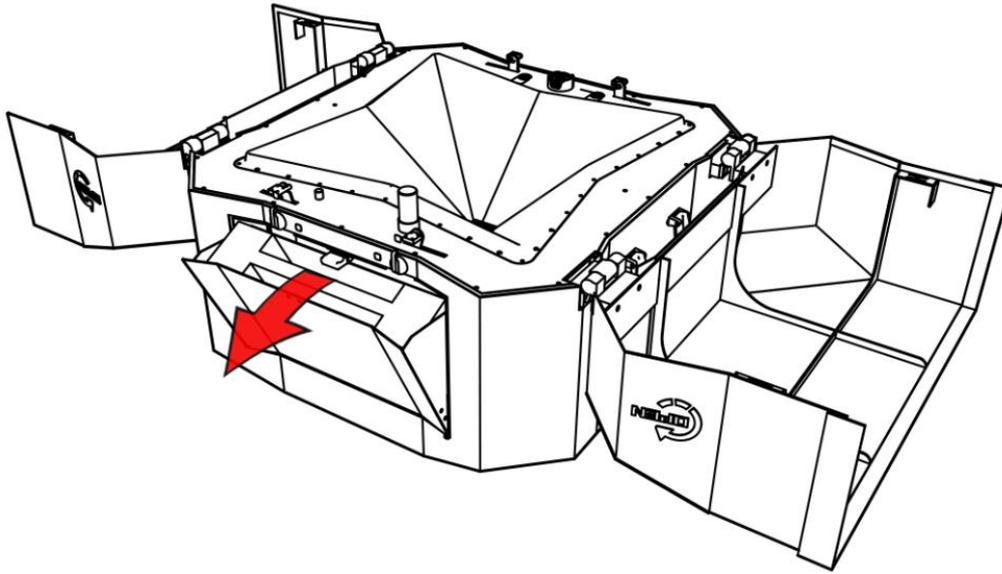
5. Take-Off Operation

5.1 Tethered system unboxing

Rotate the case lock buckle 90° outwards, unlock the top cover of the case, and open the cabin doors at the both sides.



Open the remote control door and take out the remote control.



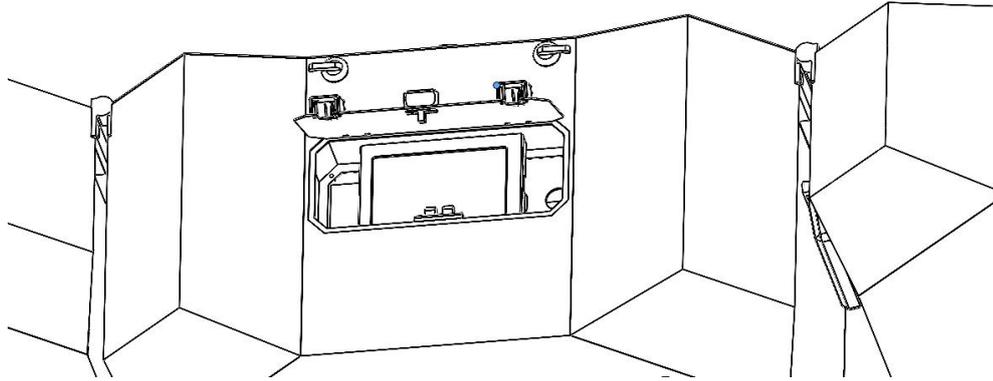
Check whether the two antennas on the cabin are loose.

5.2 Tethered system power-on

Open the cover of the power supply cabin and pull out the 220V AC cable. The AC cable needs to be connected to a stable 220V power supply. If a generator is used, it is necessary to ensure that the normal rated power of the generator is not less than 4000W, and the continuous rated output is not less than 8 hours. (Note: If the 220V input voltage is unstable, the power-off protection function of the aircraft will be activated, and the aircraft will automatically turn off the lights and land in the ground station; if it takes off again, pls charge the backup power of the aircraft before using it.)

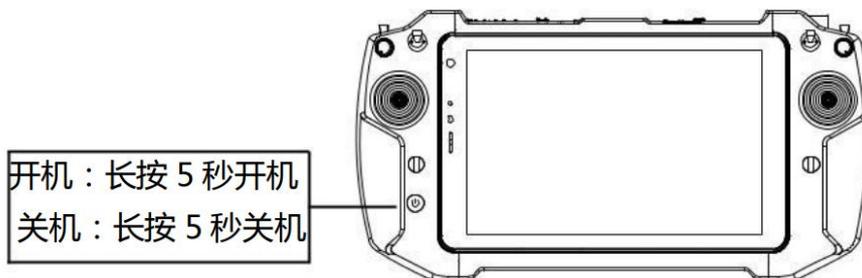
Turn on the power supply cabin power switch, emergency stop switch, winch switch.

After the screen of the cabin lights up, tap **Turn on the motor** button to start the automatic reeling of the winch.

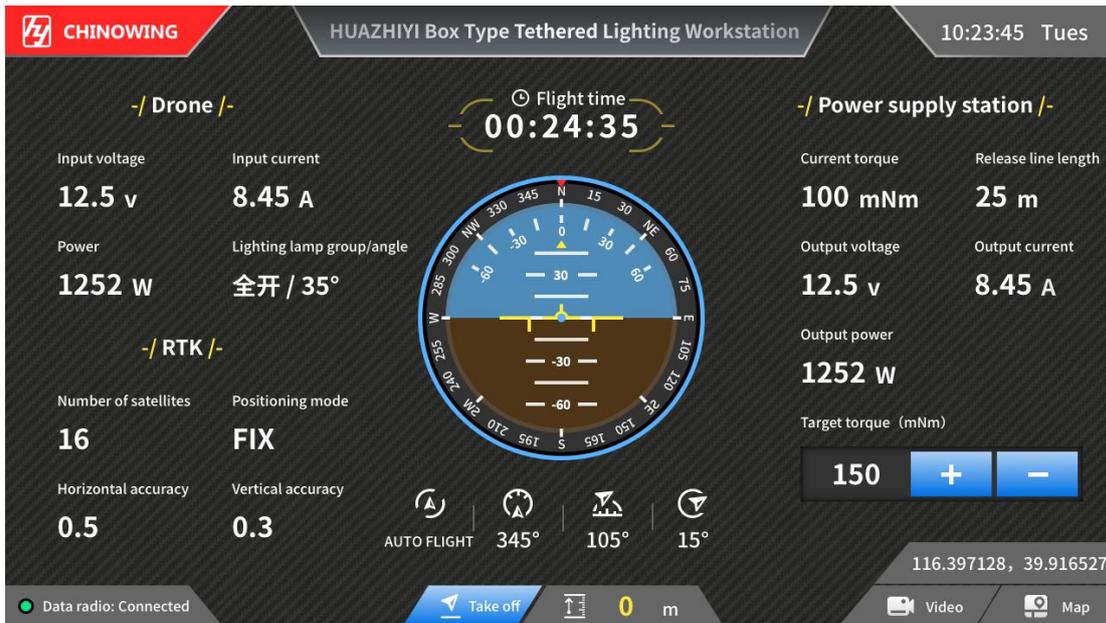


5.3 Start remote control

1. Long press the power button of the tablet, and release the power button when the startup screen can be seen.
2. After the computer is turned on, the remaining power can be checked through the power indicator icon in the lower right corner of the desktop. If the power is less than 20%, please promptly charge it.
3. After finishing the operation, pls turn off the computer through the computer shutdown interface.
4. Long press the power button for 5 seconds to turn on the remote control. After turning on, the start light is always on.



5. Open the ground station software

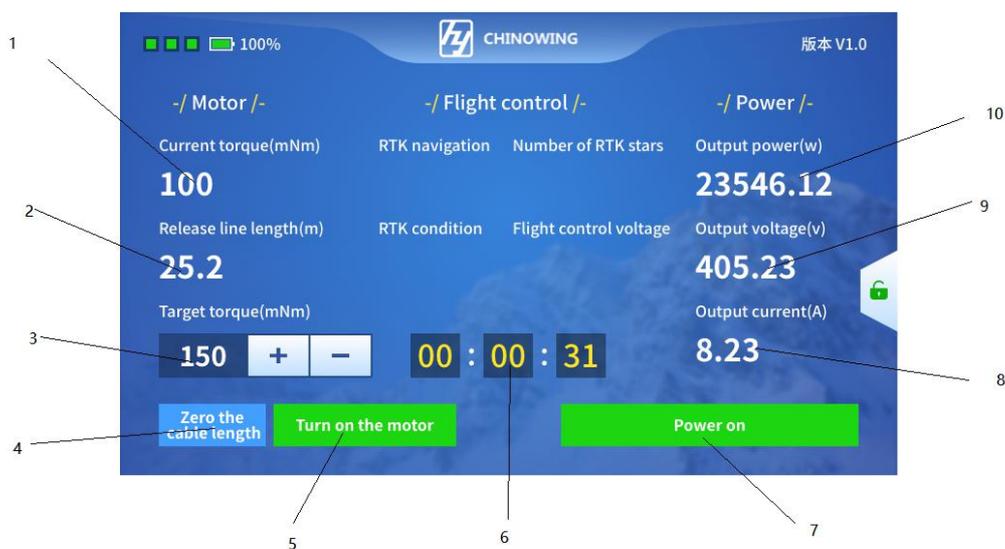


5.4 Check switch

Put the flight mode switch in the "fixed point" position, when it is in the "return" and "hold" positions, the aircraft cannot be unlocked and take off; the light group switch is in the "off" position.

5.5 Ground station control screen

The ground station control screen includes two parts. The left side is the winch control area, including the winch start button, torque adjustment button, cable length reset button and showing current torque, release cable length, and target torque display information. The right side is the output power control area, including the power-on button, output voltage, output current and other display information.



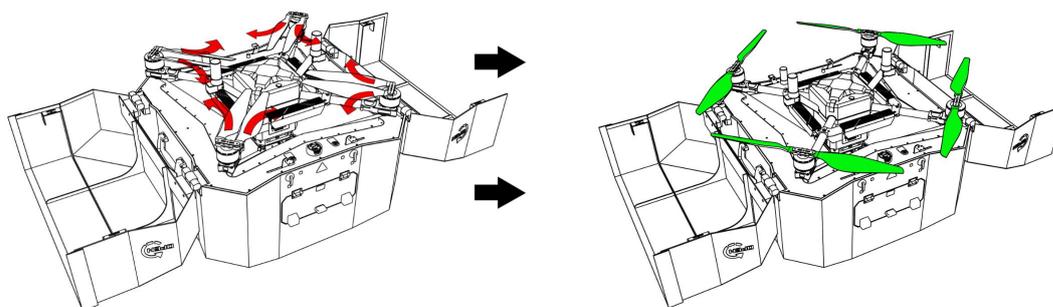
- | | |
|------------------------------------|---|
| 1. The current torque of the motor | 6. Ground station running time |
| 2. Release line length | 7. Power-on button |
| 3. Motor torque setting | 8. High voltage power supply output current |
| 4. Zero the cable length | 9. High voltage power supply output voltage |
| 5. Turn on the motor | 10. High voltage power supply output power |

After the winch switch of the GS is turned on, activate the left winch control area, long press the winch start button, and the winch starts to retract and unwind the cable normally.

After the high-voltage output switch of the GS is turned on, activate the output power area on the right, and long press it and the data such as voltage and current will be shown normally.

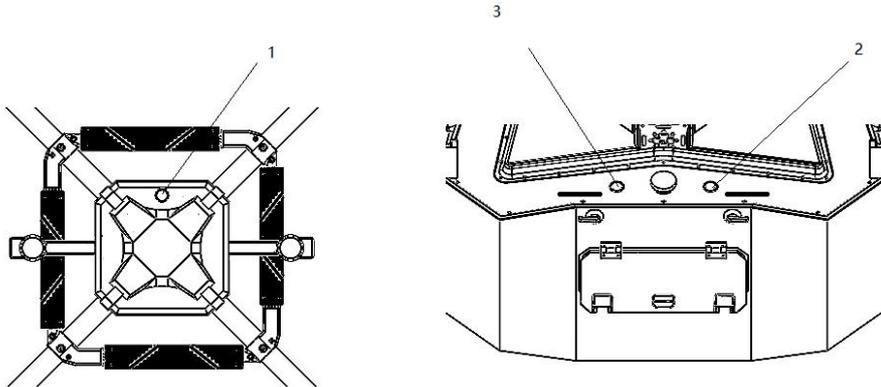
5.6 Prepare for take-off

Remove the propeller cover and unfold the propellers. The main function of the propeller cover is to protect the propeller from damage during the transportation. It should be removed before takeoff, and the propellers should be horizontally unfolded.



5.7 Power on the drone

1. Press the aircraft self-locking power switch to start the aircraft.
2. Press the high-voltage output switch of the ground station, and the tethered power supply is turned on. (The power supply will automatically charge the battery, and the battery will automatically stop charging when fully charged.)



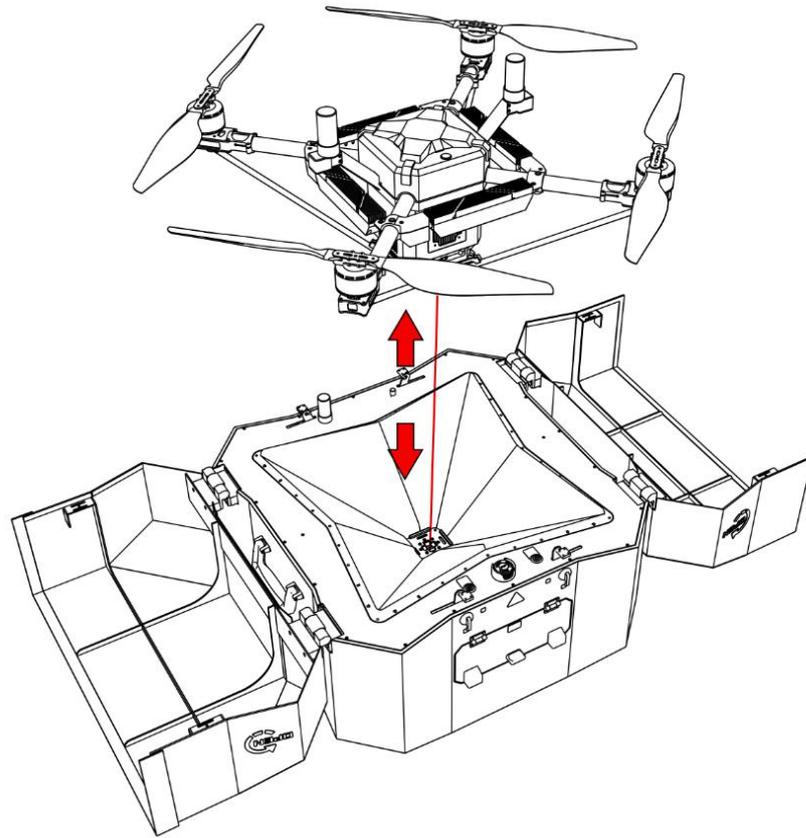
1. Aircraft power-on switch 2. High voltage output switch 3. Winch switch

Note: Before drone power-on, pls ensure the ground station power supply is started and then start the RC.

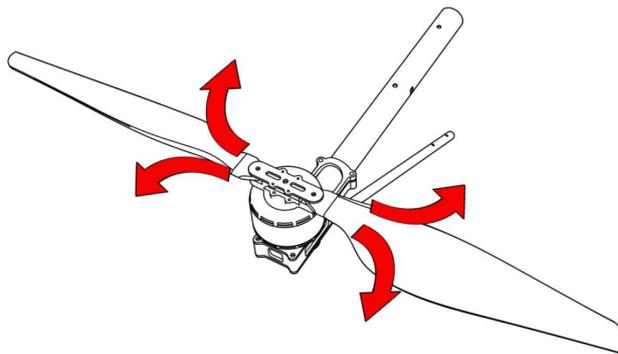
3. When the motor beep ends, the lights start to flash. During the aircraft's self-test, the lights will flash slowly. At this time the aircraft will automatically carry out the flight control self-test, RTK star search and heading positioning operations. After the lights are on, the aircraft is ready for take-off. At this point, the flight control completes the self-test, RTK positioning is completed and the heading value is locked.

5.8 Inspection before take-off

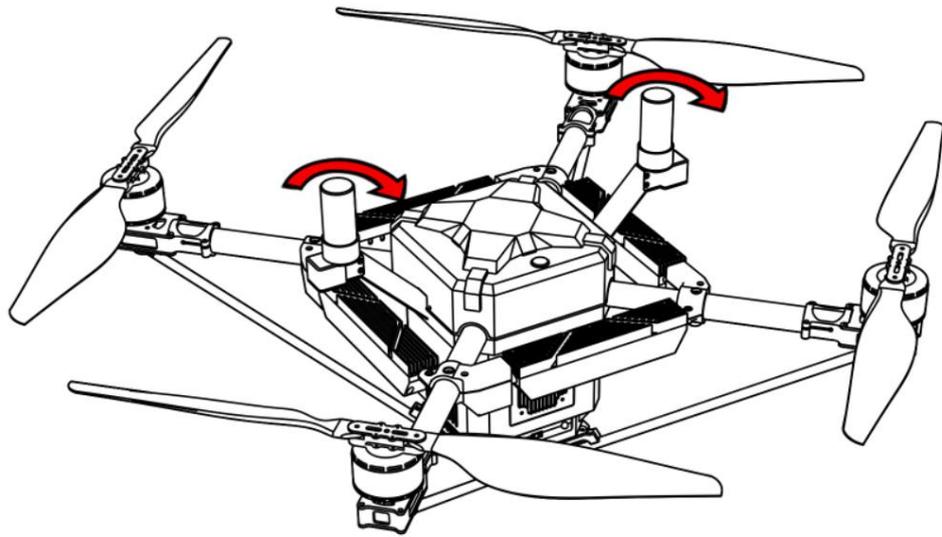
1. Lift the drone to see if the tethered cable is properly retracted. If the retracting strength is not enough, adjust the "+" button on the Ground Station screen to increase the retracting strength until the cable can be retracted smoothly; if the retracting strength is too large, adjust the "-" button on the Ground Station screen to reduce the retracting strength, until the appropriate strength. Too much strength will increase the power of the aircraft, too little strength will result in the Ground Station not being wound up in time.



2. Check whether the propellers are too tight or too loose. Too tight or too loose will increase the risk of propeller breaking.



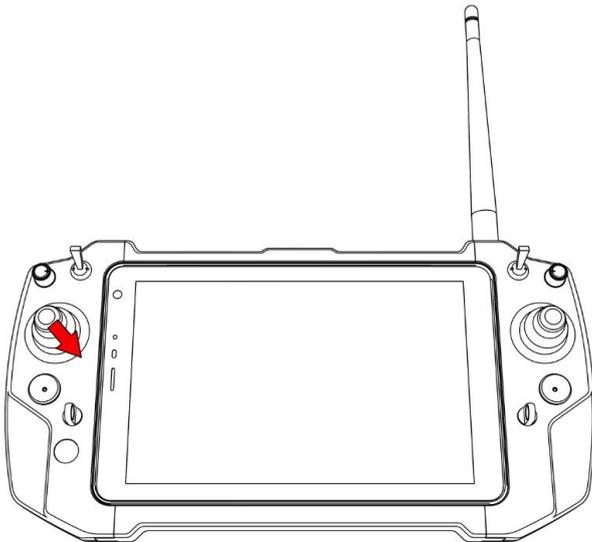
3. Check that the RTK antenna is locked. If it is not locked, the positioning of the aircraft may be lost, which will seriously cause the drone crash.



4. Check the position of the remote control switch, the mode switch "fixed point" and the light group switch "off"

5.9 Take-off

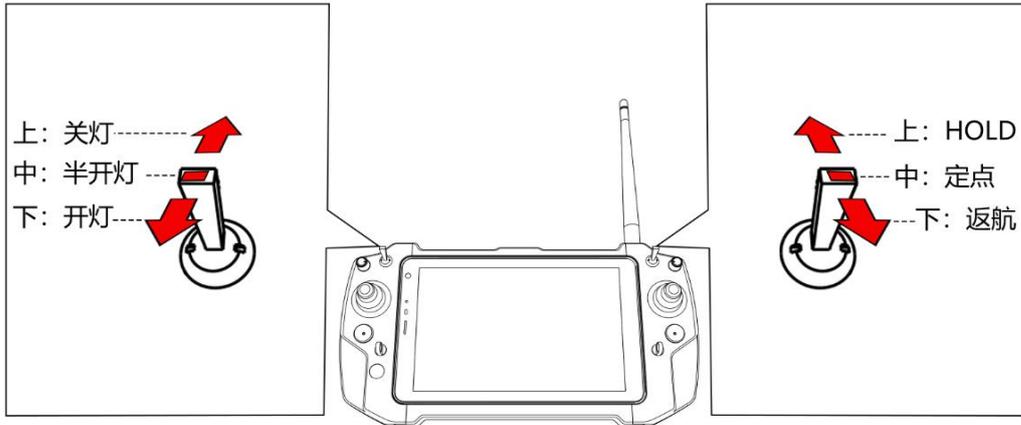
1. Wait until the drone lights are always on, ending the slow flashing state, and the drone will take off after the self-check is completed.
2. Unlock the aircraft by pulling the left joystick to the lower right position (as shown in below photo), and propellers start to work.



3. Push the left joystick slightly above the neutral position, and the aircraft will rise. The left joystick is slightly pulled to the position below the neutral position, and the aircraft descends.

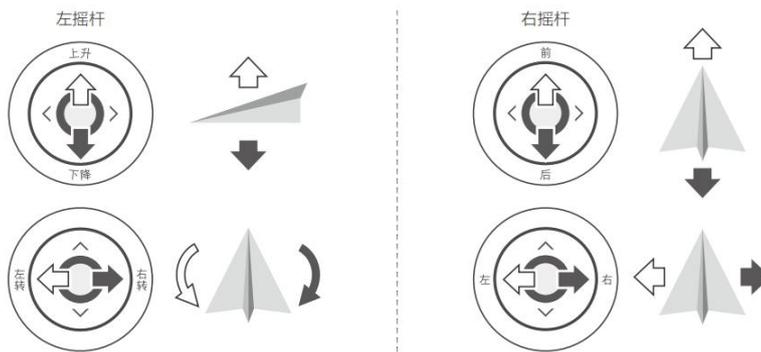
Release the joystick and the drone hovers.

4. When the plane rises to 25 meters, the drone no longer rises, and when it reaches the working height, turn on the switch of the light groups. Hold the mid-range position for 1 minute and then turn on the high position.



5. The drone is working normally.

6. The functions of the RC joystick are as follows:



Control aircraft altitude, horizontal position, and heading.

7. Light group angle adjustment: the left knob controls the front and rear, the right knob controls the left and right, and the controls are as follows:



Counter clockwise: increase the angles

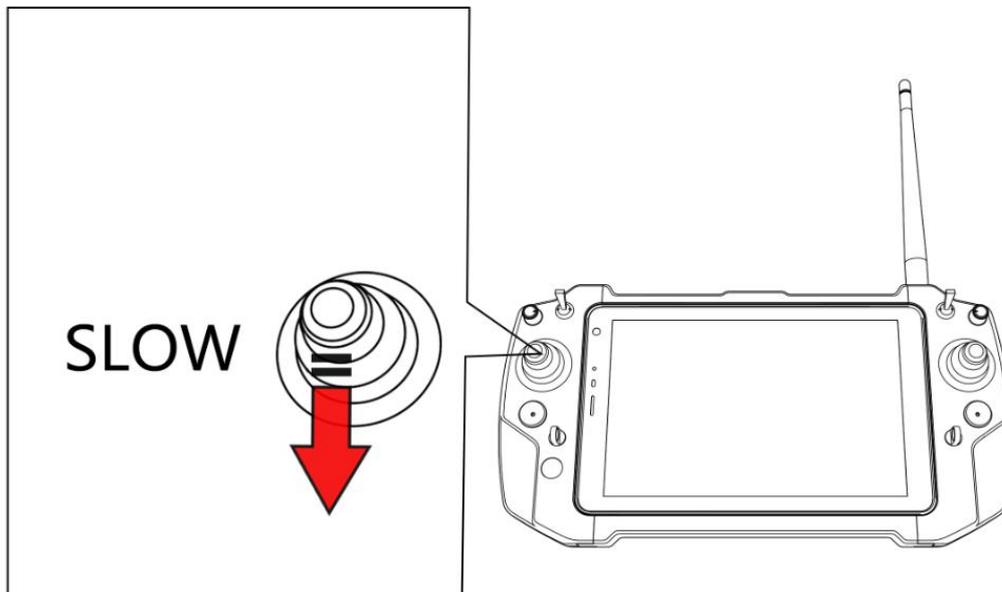
Clockwise: decrease the angles

Note: The operators require professional training before using the equipment

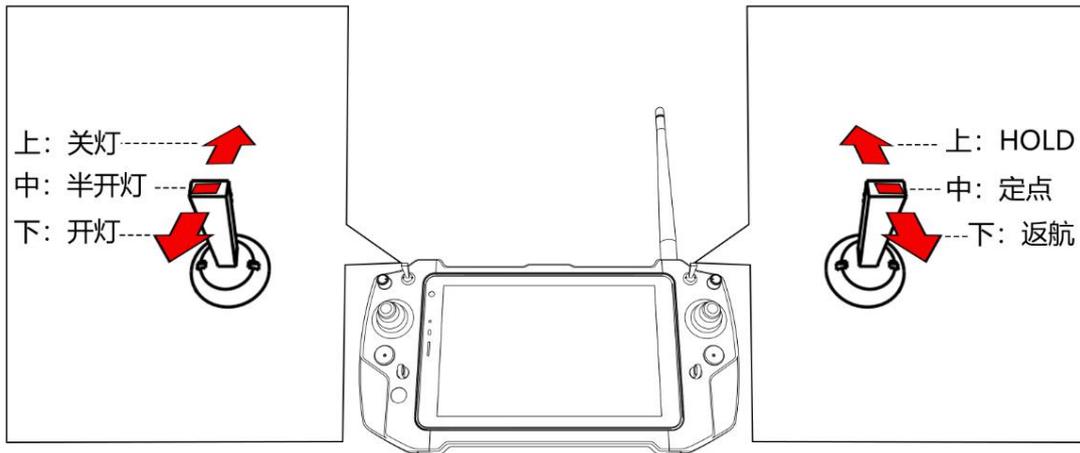
6. System Recovery Operation

6.1 Drone Landing

1. Manual recovery, pull the left joystick below the center position to land the aircraft until it lands in the ground station. During this process, the position and direction of the aircraft can be controlled by the joystick. The greater the range of joystick movement, the faster the aircraft will land. Aircraft manual recovery time is about 40 seconds.



2. Automatic recovery, the remote control mode switch is switched to the "return" position, and the aircraft automatically lands. At this time, the vision system starts to work and automatically find the position of the ground station, and the remote control does not need any operation, and the aircraft will automatically lock after landing. During this process, the operator can return to manual mode by switching the mode switch to the "fixed point" position. The automatic recycling process is about 50 seconds.



Up: light off
 Medium: half on
 Down: light on

Up: hold
 Medium: fixed point
 Down: return

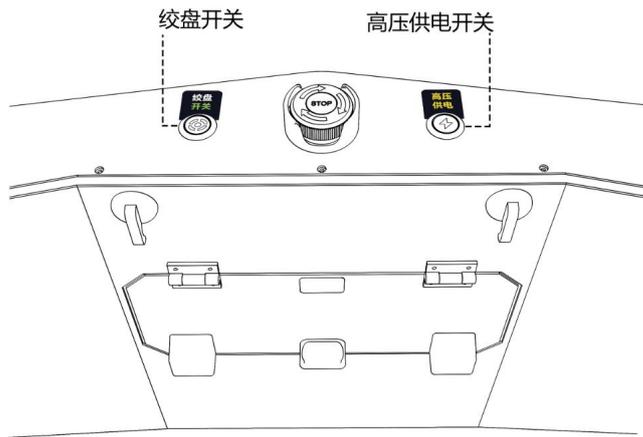
3. The left joystick remains at the lowest position for 3 seconds, and the propellers stop.

6.2 Drone power-off

1. Disconnect the high voltage output, at this time, the Ground Station will no longer supply power to the aircraft.
2. Press the power-on switch of the aircraft, the switch will automatically pop up, the drone lights will go out, and the aircraft will be completely powered off.

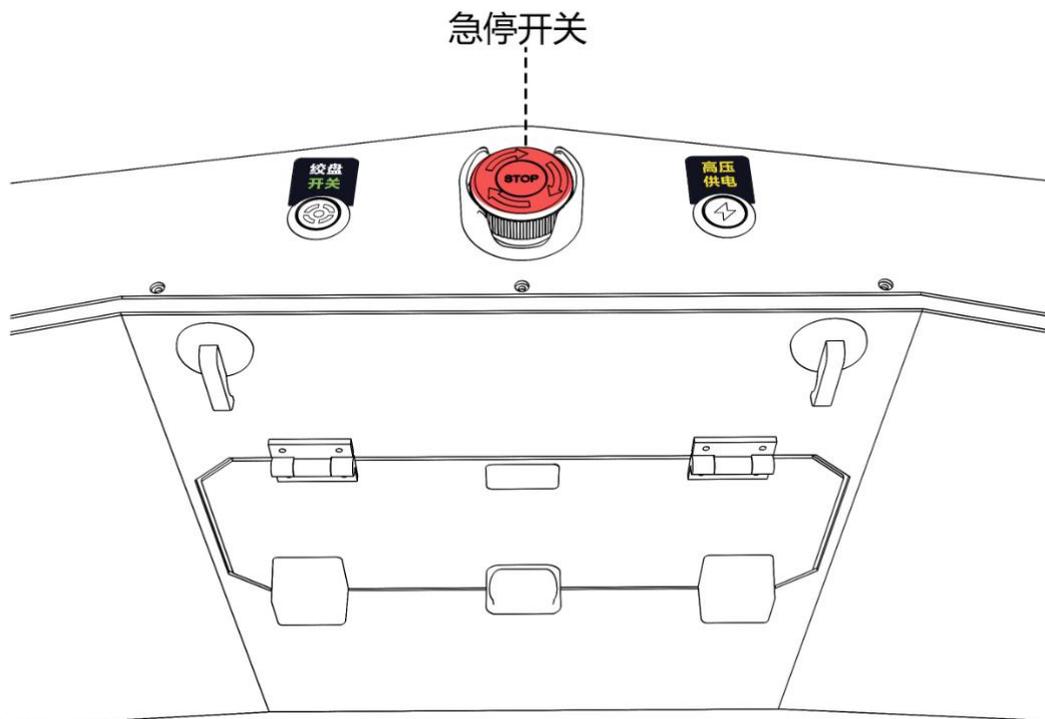
6.3 Disconnect winch switch

The winch switch light switches off and the winch is locked. At this time, the winch is locked, and the cable cannot be pulled out and retrieved.



6.4 Press the emergency stop switch

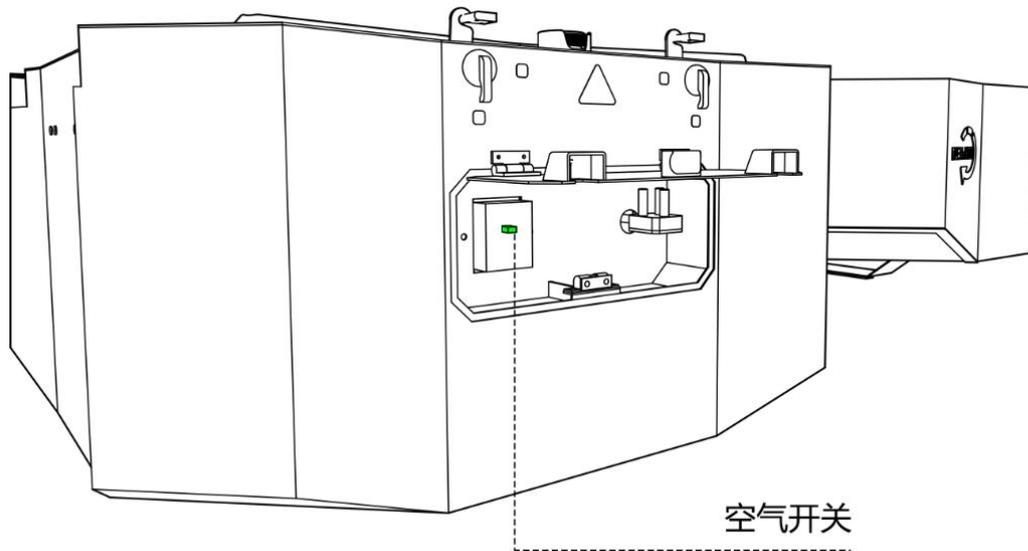
Disconnect the Ground Station 24V system and both winch and the high voltage output stop working. (Note: In case of emergency, the operator needs to press the emergency stop switch first)



6.5 Disconnect the main power switch

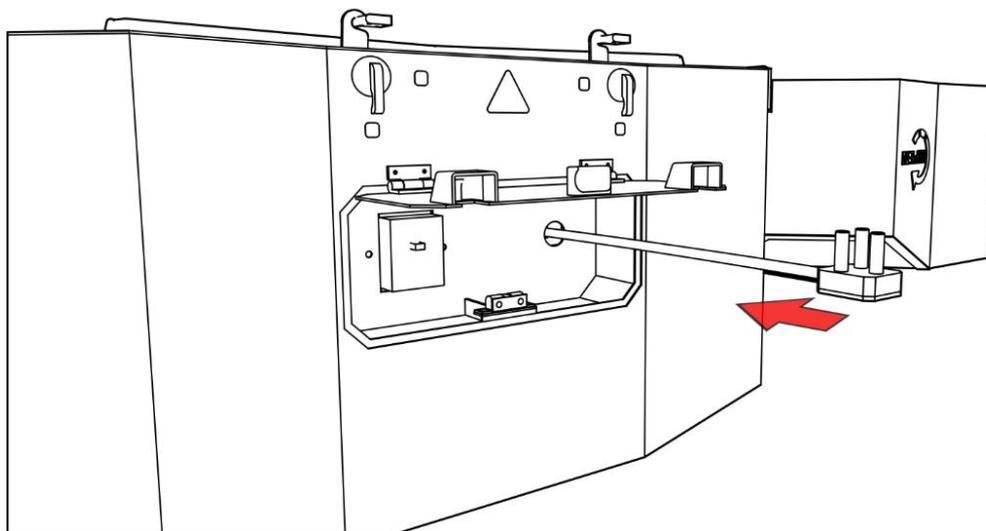
The case is completely powered off and all systems stop working. The main power supply has leakage protection function and short circuit protection function. When the cable is short

circuited or torn, it will automatically trip, disconnect the main power supply, and protect the equipment in the ground station.



6.6 Recycling the AC cable

Unplug the plug, pull the cable out, unlock the cable recovery, and the cable is automatically retracted into the case. Put the plug in place, and close the power supply cabin cover.



6.7 Remote control off

Long press the remote control switch to turn off the remote control. The power light of remote control goes out and stops transmitting signals.

(Note: Do not turn off the remote control during the flight, otherwise it will activate

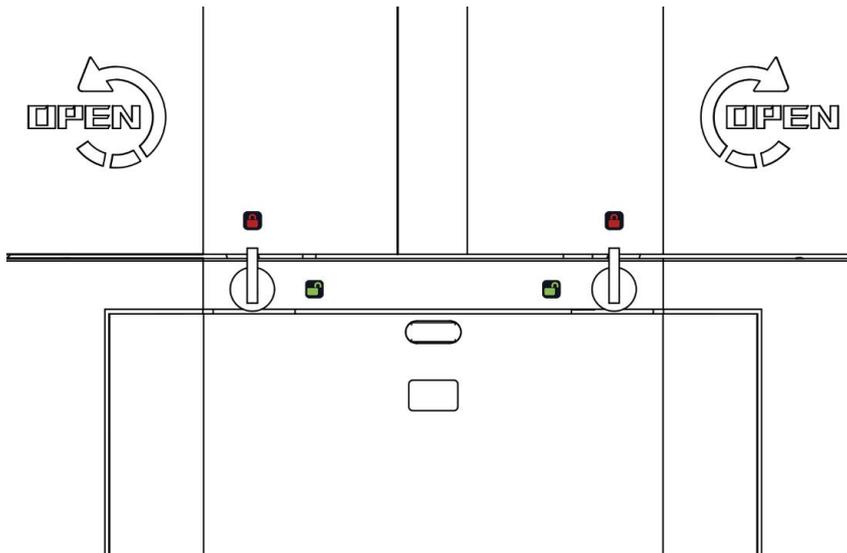
the flight control protection function and automatically land in the ground station.)

Long press and hold the tablet power button to turn off the tablet.

Put the remote back into the RC cabin.

6.8 Recycling

Store the remote control, 220V AC cable, etc in the designated location. Cover the doors on the left and right sides of the ground station and lock it. Recycling is completed.



7. Maintenance

1. When the Ground station is not used for more than one month, please power it with 220V power supply and turn on the emergency stop switch (Other switches do not need to be turned on). Charge the emergency power supply for 1h.
2. Regularly check the propellers, if there are cracks.
3. There will be dust after the aircraft runs for a long time. Pls remove the dust immediately. To blow the dust of motor, pls use high-pressure airflow, do not use other objects to touch the motor coil, in case there is a risk of short circuit of the motor.
4. After the aircraft has taken off more than one hundred times, adjust the position of the tethered cable and the aircraft lock downward, so as to prevent the cable from wearing.
5. The device has not been used for one month, charge the remote control before using.

8. Warranty

1. The purchaser enjoys a free one year warranty if the product is with poor quality or breakdowns from the date you purchase the equipment.
2. Please hold the purchase record and contact our after sales personnel to enjoy free warranty services if you are within the warranty period and under normal using circumstances.
3. In the following cases, the material cost and service fee will be charged.
 - A. Failure or damage caused by improper use if you do not follow the manual instruction.
 - B. Failures caused by repairing, disassembly and assembly by non-our company`s after sales personnel, and those that exceed the one year warranty period
4. When the following circumstances occur, the cost shall be charged.
 - A. Product damage caused by users` modification.
 - B. Damage caused by vandalism.
 - C. Damage caused by natural disasters or other irresistible factors.

Remark: Batteries and propellers are consumable parts and are not covered by this warranty.

And the battery and propellers are replaced after 200 hours of use or one year.

Version update history

Date	Version	Description	Author
2022-03-14	V1.0.0	Initial version, Planning version	HZY
2022-03-15	V1.1.0	The first version of the official release	HZY