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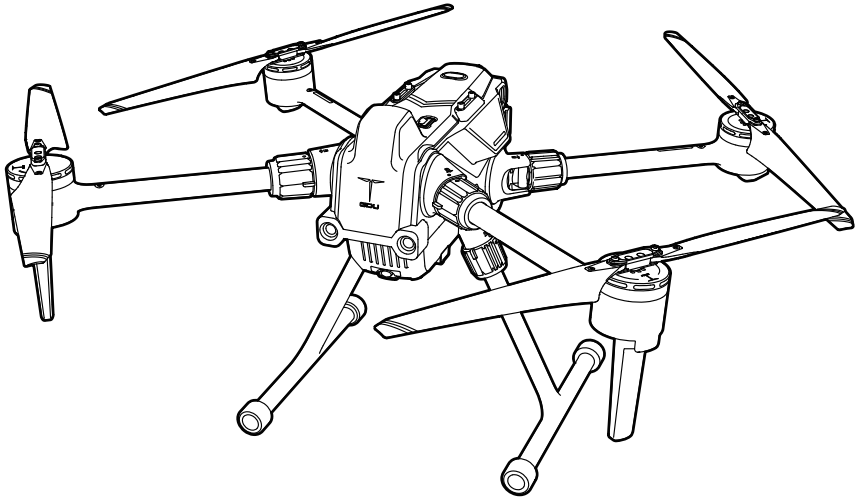
GDU



S400E Quadrotor UAV

v1.0 2023.07

User Manual *GDU RC SEE*

CONTENTS

User Instructions

Warning

Thank you for using this GDU product. This product is a special electronic product. Improper operation may result in property damage, personal injury, or even death. The user will bear the legal consequences of these actions. This product must not be used by juveniles under the age of 18. In order to ensure a positive operating experience and to protect your personal safety, please carefully read the following documents before use:

Disclaimer and Safety Guidelines
Item List
User Manual
Quick Start Guide
Intelligent Battery Safety Guide

This document is subject to updates without notification. Please refer to the latest version at www.gdu-tech.com.

UAV legal registration

As per the Provisions on Real-time Registration Management of Civil Unmanned Aerial Vehicles of the Civil Aviation Administration of China, all UAV owners must register their real name and fill any related information at time of purchasing their UAV in the official government UAV registration system (https://uom.caac.gov.cn/), and paste the registration mark on the hull of the UAV.

Product Overview

This chapter mainly introduces the functional characteristics of the product, the guidelines for aircraft instruction, as well as the names of parts of the aircraft and the remote controller.

Product Overview

Introduction

The S400E is equipped with an advanced flight control algorithm, camera processing algorithm, gimbal stabilization algorithm, and visual AI algorithm. By integrating an omnidirectional obstacle avoidance system, high-precision RTK system, and visual positioning system, this product is capable of automatic patrol inspection, AI intelligent object recognition and tracking, automatic return, automatic precision landing, and other autonomous flight functions. In addition, visual assistance positioning, visual omnidirectional obstacle avoidance, and other functions ensure a safer and more stable flight of the UAV. The portable fuselage is easy to fold and carry. The maximum battery life is 58 minutes (1), and the flight control radius is 15 km (2). As it can be used with different types of payloads, this product can meet the needs of different industries in complex Applications and various scenarios.

① The maximum battery life is affected by the environmental climate, and the reference value is 58 minutes.
② The flight control radius of 15 km was measured in an open environment using line of sight operation in a straight-line range test at an altitude of 200 m.

Function highlights

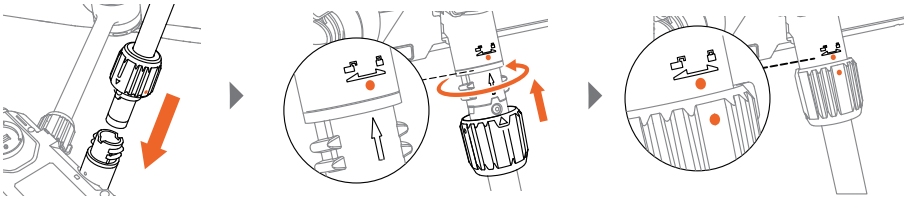
1. Relay networking and cross-barrier communication: Use the relay to realize the cross-barrier communication and networking where mountains are completely blocked.
2. Obstacle avoidance day and night with everything under control: Integrate millimeter-wave radar and binocular visual obstacle avoidance technology, enabling accurate sensing of obstacles at night.
3. 58-minute flight time and durable propulsion: High-efficient propulsion system in the UAV ensures a super-long flight.
4. 23m/s flight speed and robust flight: The maximum flight speed is 23m/s, and the wind resistance is up to Level 7.
5. Lightweight and portable One pack bag can accommodate all devices and tools with the overall size (folded) as small as a piece of A4 paper.
6. Multiple payloads and robust functions: The payload is 3kg . It supports dozens of payloads, including quad-sensor camera 1K thermal & visible dual camera, and 8K visible camera. (3)
7. Megapixel infrared light camera captures every detail: The megapixel thermal & visible dual camera has an effective pixel up to 1280×1024, which is 4 times of the highest pixel of infrared payloads on the market. It is capable of working day and night, and capturing every details of an object.
8. Intelligent docking station and unattended operation: When the UAV is used with the intelligent docking station, it is capable of accurate takeoff and landing day and night with non-stop and unattended operation.

③ The payload is 3kg. The aircraft will restrict its flight speed to ensure flight safety.

Preparation of the aircraft

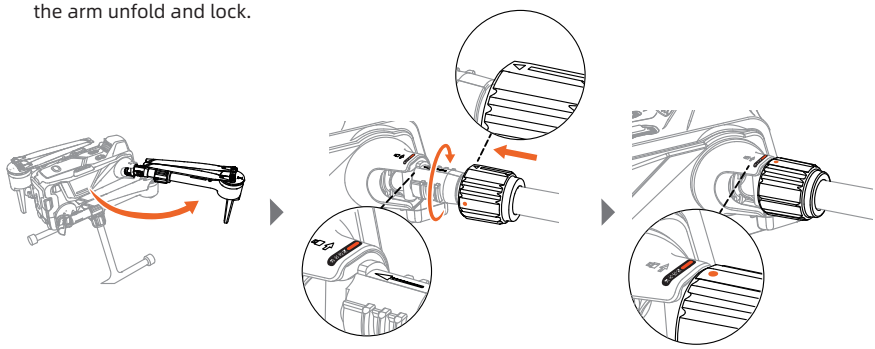
Installation of the left and right landing gears

1. Insert the landing gear into the landing gear connection base.
2. Push the landing gear locking ring into the seat of the landing gear connection base indicated by the direction arrow, and rotate it based on the locking direction indicated on the fuselage.
3. Align the orange point on the landing gear to the orange point on the fuselage to complete the installation.

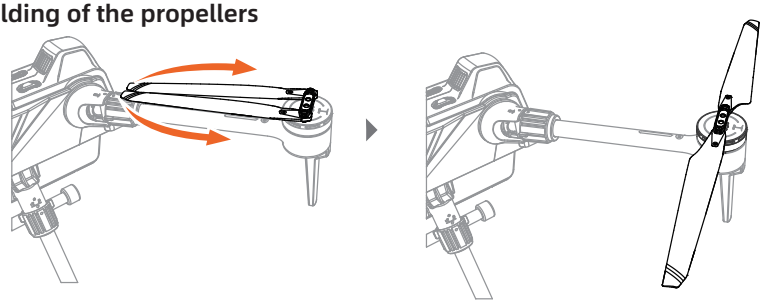


Unfolding and locking of the arms

1. Unfold the arms one by one.
2. Push the arm locking ring into the seat of the arm connection base indicated by the direction arrow, and rotate it based on the locking direction indicated on the arm.
3. Align the orange dot on the drone arm with the orange area marked on the fuselage to complete the arm unfold and lock.



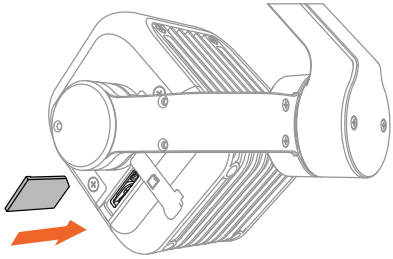
Unfolding of the propellers



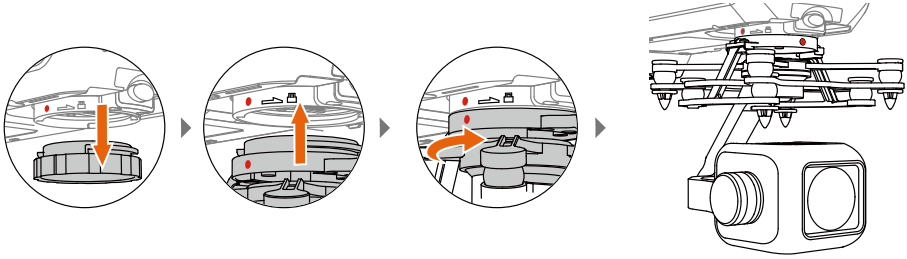
⚠ • Before a flight, make sure that the arms, propellers, and landing gears are all unfolded and locked in position properly.

Installation/removal of the gimbal camera

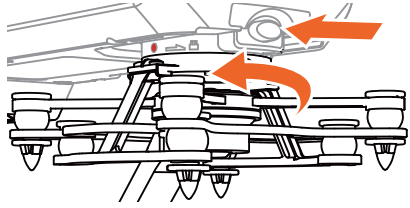
1. Insert the micro-SD card based on the position shown on the gimbal.



2. Press the payload unlocking button to remove the protective cover.
3. Align the red point on the payload interface and insert the gimbal into the installation position.
4. Rotate it by 90° based on the direction shown on the casing to lock it.



5. Press the payload mount adaptor button, and rotate the gimbal by 90° based on the direction shown on the casing to remove it.

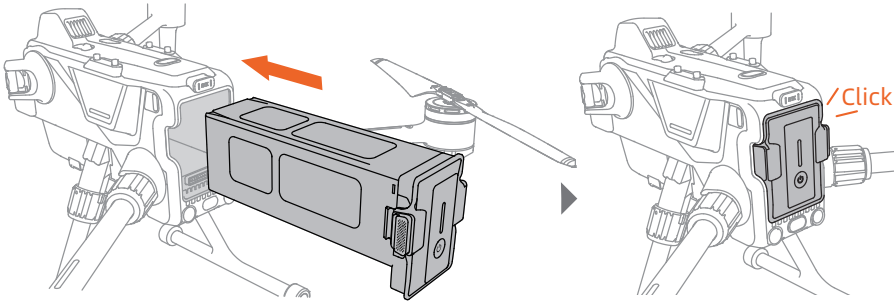


⚠
- When the payload mounts are aligned, manually rotate the payload interface connector by 90° and install the gimbal.
- The gimbal camera models shown in the figure are only for purposes of illustration.
- It is required that the aircraft be powered off before mounting the gimbal.
- Please power off the aircraft before inserting or removing a micro-SD card. High-speed micro-SD cards of Samsung, SanDisk and other brands are supported.

Installation of intelligent batteries/checking of battery levels

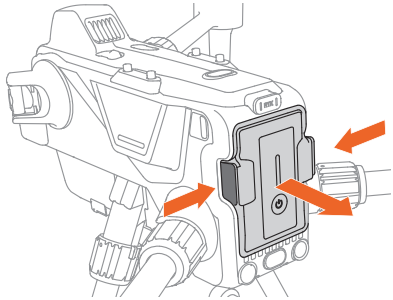
Battery installation/removal

Battery installation: Put the battery into the battery compartment and push it horizontally until you hear a "click" sound. The installation is complete when the latches on both sides of the battery snap up.



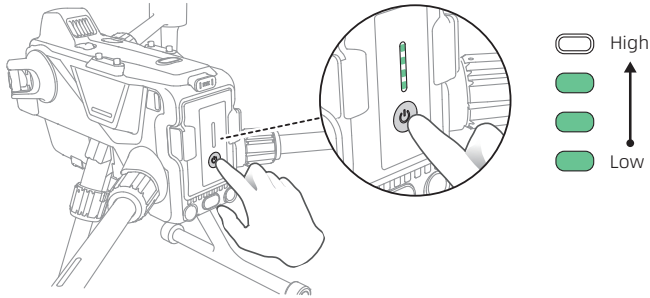
Battery removal

Press the latches on both sides of the battery and pull the battery outwards to remove it.



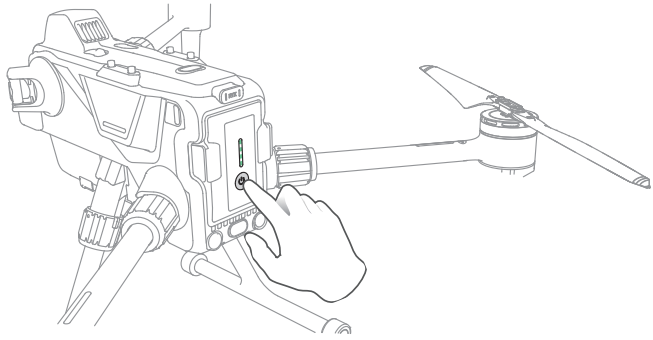
Checking battery levels

Press the battery power button once to display the current battery level.



Powering on

Powering on: Press the battery power button once, and press and hold the power button for 3 seconds. At this point, you will hear a beep sound, and the aircraft indicator light is up.
Powering off: Press the battery power button once, and press and hold the power button for 3 seconds to power off. After powering off, the aircraft indicator light is off.



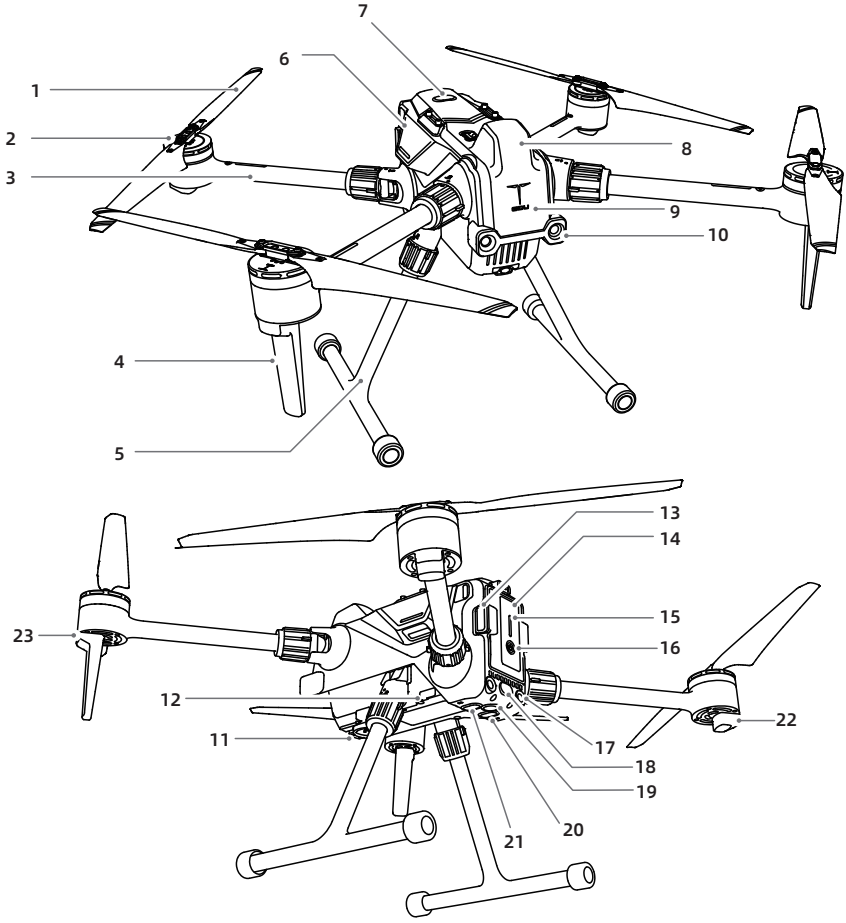
Pairing

When the aircraft is powered on, press the aircraft power button 8 times continuously. The aircraft will enter the pairing status, and the aircraft status indicator light is solid white. At this point, there are two pairing ways:

1. When the remote controller is powered off, press the power button and return button at the same time, until the remote controller indicator lights blink alternately. At this point, the remote controller enters the pairing status. After the pairing is successful, the aircraft indicator light is solid green, and the pairing completes.
2. After the aircraft enters the pairing mode, power on the remote controller and connect the same to the App. On the flight interface of the App, click "Settings" - "Remote Controller Settings" - "Remote Controller Pairing" to start pairing. After the pairing is successful, the aircraft indicator light is solid green.

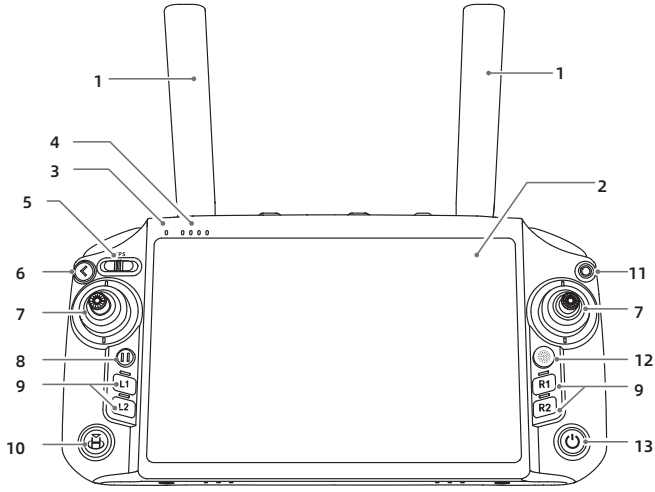
⚠
- When the remote controller and the aircraft are purchased in the form of combo, it is defaulted to be paired with the aircraft during ex-factory.
- This linking method is applicable to the case when a single aircraft is paired with a single set of remote controller. For the pairing between several aircraft and remote controllers, please refer to Advanced Network Mode (p31).

Aircraft parts

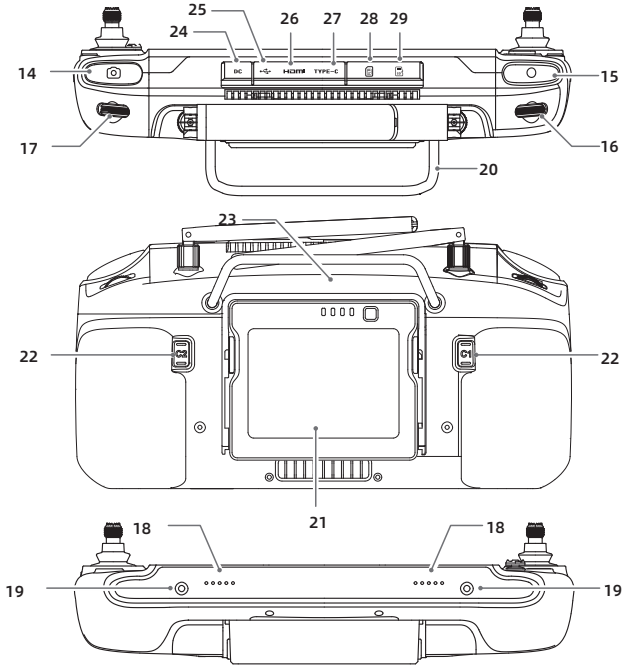


1	Propeller	9	Front radar	17	Rear visual system
2	Motor	10	Front visual system	18	Rear TOF
3	Arm	11	Payload interface	19	Bottom auxiliary light
4	Video transmission antenna	12	Video transmission master/slave button - debugging interface	20	Downward visual system
5	Landing gear	13	Battery buckle	21	Underneath TOF
6	Side radar	14	Intelligent batteries	22	Rear arm indicator light
7	Upward TOF	15	Battery level indicator light	23	Front arm indicator light
8	RTK antenna	16	Battery power button		

Remote controller parts



1. **External antenna of remote controller**
   Transmits the control signals and video transmission wireless communication signals between the aircraft and remote controller.
2. **Touch display screen**
   Displays the system and App-related screen, and support 10-point touch control. If there is water on the screen during use, wipe it clean to avoid affecting the touch function.
3. **Status indicator light**
   Displays the remote controller's system status. For details, refer to the "Remote Controller Indicator Light" section.
4. **Battery level indicator light**
   Displays the remote controller's current battery level.
5. **Flight mode switch**
   Switch flight modes. Includes T mode (Tripod), P mode (Standard) and S mode (Sport), A mode (attitude),which can be customized in the App.
6. **Return button / system function button**
   Click to return to the previous interface, and double click to return to the system's homepage. For combination buttons using the return button and other buttons, refer to the "Remote Control Button Function" section for details.
7. **Control stick**
   Switch flight modes in GDU Flight II.
8. **E-stop button**
   Press once and the aircraft will carry out emergency braking and hover in place (when the GNSS or vision system is in effect).
9. **L1 / L2 / R1 / R2**
   Check the functions corresponding to the buttons in GDU Flight II.
10. **Intelligent return button**
    Press and hold to start intelligent return, and press once to cancel intelligent return.
11. **Confirm button**
    Click to confirm the current operation.
12. **5D button**
    Up, down, left, right and re-center.
13. **Power button**
    Press once to turn on / off the remote controller display screen. When the remote controller is powered off, press and hold the power button for 3-5s to power it on; when the remote controller is powered on, press and hold the power button for 3-5s and click the "Off" button displayed on the remote controller screen to power it off; when the remote controller is powered on, press and hold the power button for 8s for forced shutdown.



14. Photograph button
    Press to take photos.
15. Video button
    Start or stop recording.
16. Left dial wheel
    Toggle to adjust the gimbal camera's pitch angle.
17. Right dial wheel
    Toggle to adjust the gimbal camera's EV value.
18. Pickup
    Avoid foreign matter blocking during use, which may affect the pickup effect.
19. Lanyard hole
    It is used for installing the remote controller strap.
20. Handle
21. External battery of remote controller
22. C1 / C2 button (customizable)
23. Speaker
24. DC charging interface
25. USB-A interface
    Connect to mobile devices, USB card readers or network transfer output.
26. HDMI interface
    Output a HDMI signal to the external display.
27. TYPE-C interface
    It is used for Android system debugging, external extension and connecting to a charging device to charge the remote controller.
28. SIM card
    Connect to the mobile network.
29. SD card
    The microSD card can be inserted.

Aircraft

This chapter introduces various functional characteristics of the flight control system, visual system and intelligent battery in the aircraft.

Aircraft

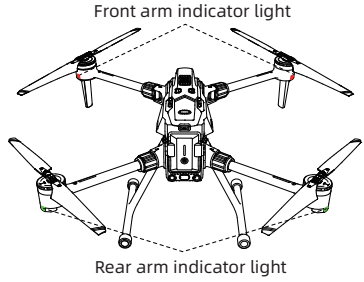
Aircraft overview

The S400E aircraft mainly consists of a flight control system, a communication system, a visual system, an image processing system, a propulsion system and a battery system. This chapter introduces the functions of various components on the aircraft in detail.。

Aircraft indicator light

The fuselage has a total of 4 front and rear arm indicator lights, and their positions are shown in the figure.
The front and rear arm indicator lights indicate different flight status. For the specific meanings, please refer to the table below:

⚠ • The front arm indicator light is solid red, indicating the aircraft nose heading.



Normal status	Front arm indicator light	Rear arm indicator light
System self-check	Red, green, and blue indicator light are solid on in succession	Red, green, and blue indicator light are solid on in succession
Magnetometer horizontal calibration	Yellow indicator light is solid on	Yellow indicator light is solid on
Magnetometer vertical calibration	White indicator light is solid on	White indicator light is solid on
Algorithm converging	White indicator light blinks once for 0.5s	White indicator light blinks once for 0.5s
Return	Red indicator light is solid on	Green indicator light blinks once for 1s
Attitude mode	Red indicator light is solid on	Yellow indicator light is solid on
Sport mode	Red indicator light is solid on	Green indicator light blinks once for 1s
Standard mode	Red indicator light is solid on	Green indicator light is solid on
Power on the aircraft and connect to the remote controller	Red indicator light is solid on	Red indicator light blinks once for 1s
Pairing	White indicator light is solid on	White indicator light is solid on
IMU calibration status ready	Indicator light is solid cyan	Indicator light is solid cyan
Warnings and errors	**Front arm indicator light**	**Rear arm indicator light**
Magnetometer horizontal calibration error	Yellow indicator light blinks once for 0.5s	Yellow indicator light blinks once for 0.5s
Magnetometer vertical calibration error	White indicator light blinks once for 0.5s	White indicator light blinks once for 0.5s
IMU1 error	Red indicator light blinks once for 0.2s	Red indicator light blinks once for 0.2s
Barometer error	Red indicator light blinks once for 0.2s	Red indicator light blinks once for 0.2s
Magnetic error	Red indicator light blinks once for 0.2s	Red indicator light blinks once for 0.2s
Emergency low battery alert	Red indicator light is solid on	Red indicator light blinks once for 0.2s
Low battery alert	Red indicator light is solid on	Red indicator light blinks once for 0.5s
Battery system error	Red indicator light is solid on	Red indicator light blinks once for 1s
In a no-fly zone or outside a Geofence	Red indicator light is solid on	Red indicator light blinks once for 0.5s
Approaching a no-fly zone or Geofence	Red indicator light is solid on	Yellow indicator light blinks once for 0.5s
Lost communication and no-error status	Red indicator light is solid on	Red indicator light is solid on

Flight modes

The aircraft has the following flight modes, which can be switched manually through the remote controller and the GDU Flight II App. Details are as follows:

1. A mode (attitude)

The forward / backward obstacle sensing system, GNSS positioning and downward visual positioning system do not work; when the aircraft is off the navigation control, it will drift in the horizontal direction if the control stick is not pushed. It is required to use the control stick for real-time control.

2. P mode (standard)

If the GNSS signal is strong, the aircraft will be positioned through GNSS; if the GNSS signal is weak and the light conditions meet the needs of the intelligent visual positioning system, the intelligent visual positioning system will be used. If the GNSS signal and visual assistance positioning fail, the aircraft will automatically switch to the A mode to be controlled by a professional pilot.

3. S mode (sport)

The S mode is the enhanced mode under the P mode. The aircraft performance is enhanced, and the GPS and the downward vision positioning system is functioning. The aircraft's control sensitivity value is prompted, and the flight response is quick. Please fly with caution. In this mode, the obstacle avoidance system is disabled, and the aircraft is unable to avoid obstacles automatically

4. T mode (tripod)

The tripod mode restricts the aircraft's maneuvering performance on the basis of P mode to make the aircraft shooting more stable.

5. V mode (Vision)

The V mode refers to vision positioning mode. When the GNSS signal is weak, and aircraft altitude is lower than 9 m, the system will automatically switch to the V mode. At this point, the aircraft's maximum speed is restricted to 10 m/s.

Special note

A mode (attitude) description

1. The A mode is a professional mode. Please do not switch to this mode in non-special conditions.
2. When the GNSS satellite signal is weak or the compass is interfered, and the vision positioning conditions are not met, the aircraft will enter the attitude mode in a passive manner.
3. The user can use the flight mode switch button on the remote controller to manually switch to the A mode. In this mode, the aircraft is likely to be interfered, and will drift in the horizontal direction. In addition, the visual system and some intelligent flight modes will not work. Hence, the aircraft cannot achieve fixed-point hovering and automatic braking on its own in this mode. The user needs to manually control the remote controller to hover the aircraft.
4. In this mode, it is much more difficult to control the aircraft. The user must be familiar with the aircraft behavior in this mode and be capable of operating the aircraft skillfully. The user should never fly the aircraft for a long distance to avoid the loss of determination of the aircraft attitude, which may cause a risk.
5. Once the aircraft enters the attitude mode in a negative manner, please land the aircraft as soon as possible to a safe place so as to avoid accidents. Meanwhile, avoid flying the aircraft in a narrow, semi-obstructed environment, or an environment with weak GNSS satellite signals to avoid entering the attitude mode in a passive manner, which may result in flight accidents.
6. When the aircraft triggers the vision mode, it can only be switched to the A mode. The other modes do not work.

S mode (sport) description

1. The user must note that, when flying the aircraft in the S mode (sport), the visual obstacle avoidance will not work. The aircraft will not actively brake. The user must take note of surrounding environments and operate the aircraft to avoid obstacles along the flight route.
2. The user must note that, when flying the aircraft in the S mode (sport), the aircraft's flight speed is much increased than that in the P mode (standard). As such, the braking distance is greatly

increased. When flying the aircraft in a windless environment, the user should reserve at least 50 m braking distance to ensure flight safety.

3. The user can switch the P mode to the S mode for operation only after getting familiar with the aircraft characteristics and various flight modes.

V mode (vision) description

The V mode is an auxiliary positioning mode and will be automatically triggered when the GNSS signal is weak. Once the GNSS signal is effective again, the aircraft will automatically switch back to the GNSS mode.

Automatic return

The aircraft comes with an automatic return function. There are four methods to execute the automatic return, that is "one-button return", "low power return", "lost communication return" and "accurate return".

During takeoff, the aircraft will record the GNSS coordinates, which correspond to the return point (also called "HOME point"). If automatic return is triggered, the aircraft will automatically return to the HOME point, which is only valid for this flight.

⚠ • The HOME point is generated only for effective GNSS coordinate records. When the GNSS signal is weak before the aircraft takeoff, the aircraft will take off in the A mode or the V mode. Then, the position of the recorded HOME point is the coordinate point that takes effect for the first time during the flight process, and not the takeoff point.

1. One-button return

Automatic return can be triggered during the flight process by pressing the "Return" button on the remote controller or by clicking "" in the APP. During the return process, the user can use the "Control stick", "RTH" button or the app interface to exit the return cycle and regain active control.

2. Low power return

Two mechanisms are provided: low power return and emergency low power landing.

Low power return

When the intelligent battery's battery level is too low to return the aircraft,the user should land the aircraft as soon as possible. To prevent unnecessary dangers due to insufficient battery level, the aircraft will intelligently determine whether the current battery level is sufficient based on the flight position information. If the current battery level is only sufficient for the aircraft to return, the GDU Flight II App will remind the user whether to return or not. If the user makes no choice within 15 seconds, the aircraft will automatically return after 15 seconds. During return, the user may press the intelligent return button on the remote controller or click Cancel Return on the App to exit return. Intelligent return only occurs once in the same flight process. If the user cancels the low power return prompt and continues the flight, the aircraft may be forced to land during the return due to an insufficient battery level, resulting in aircraft loss or crash.

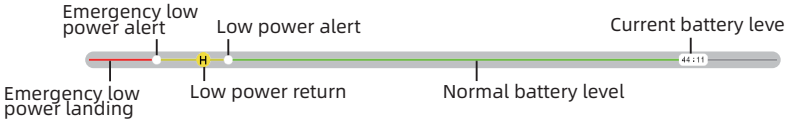
Emergency low power landing

In case of emergency low power, the aircraft will be forced to land, which cannot be canceled. During the returning and descending process, the user can use the remote controller (if the remote controller signal is normal) to control the aircraft.

Low battery alert

When the aircraft is at a low battery level status, the aircraft signal indicator light will blink red slowly. When the aircraft is at a emergency low power status, the aircraft signal indicator light will blink red quickly.

The low battery alert threshold can be set on the App interface. The ex-factory default low battery alert value is 20%, and the emergency low power landing alert value is 5%.



Battery level indication	Meaning	Aircraft status indicator light	App interface prompt	Flight
Low power return	Remaining battery level is only sufficient for the aircraft to return safely.	Blink green slowly	Prompt whether to return or not. If the customer makes no choice, the aircraft will default to return after 15 seconds. The user can return the aircraft immediately or cancel the return.	After selection, the aircraft will automatically return to above the HOME point and enter an automatic landing process. The user can regain the control right during return, and land the aircraft. Notes: After the control right is regained, the intelligent return prompt box will not appear again.
Emergency low power landing	Remaining battery level is only sufficient for the aircraft to land at the current altitude.	Red light blinks quickly	Remind the user that the aircraft is being forced to land, which cannot be canceled.	The aircraft will land automatically.
Current battery level	Remaining flight time supported by the current battery level	None	None	None
Low battery alert	The user sets the alarm value on their own.	Red light blinks slowly	Give a beep alarm.	None
Emergency low battery alert	The user can automatically set the alarm value, which should not be greater than the low battery alert value.	Red light blinks quickly	Give urgent beep alarms.	None

3. Lost communication return

During the flight process, if the remote controller is disconnected from the aircraft, the aircraft will trigger a lost communication return (It is required to set the lost communication action to return in the App). During the return process, if the signal connection between the remote controller and the aircraft restores to normal, the aircraft will continue to return. During the return process, the user can press the intelligent return button on the remote controller or click Cancel Return on the App interface to cancel the return.

4. Accurate return

In the App, the user can set the return mode to accurate return. In this mode, the aircraft will accurately land after returning to the HOME point. The user should ensure that when the return mode is selected or modified, there is an accurate landing 2D code at the HOME point.

Obstacle avoidance during return

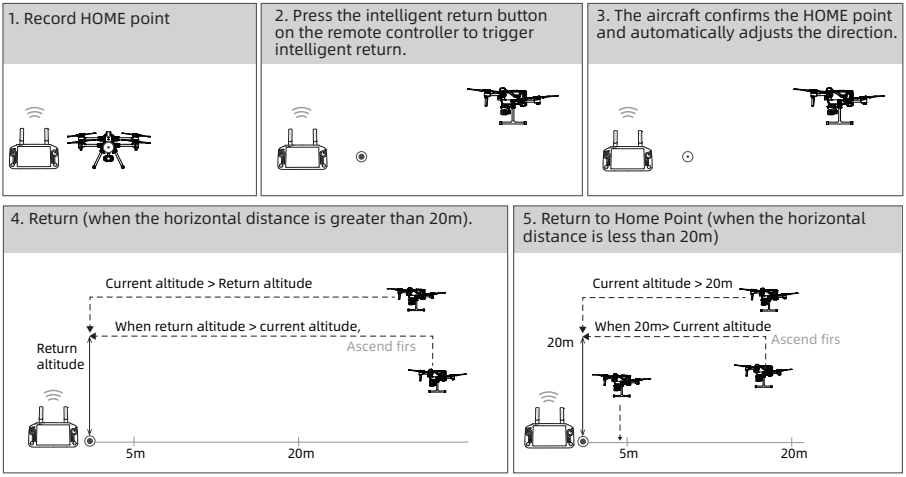
With the obstacle avoidance during return, the aircraft can automatically avoid the obstacles ahead and return safely. By default, the obstacle avoidance during return is enabled.

⚠
- The obstacle avoidance capacity during return is related to the obstacle scenario. The obstacle avoidance capacity varies in different scenarios. The return speed can be set between 5m/s and 15m/s.
- The return speed can be set to 15m/s when the aircraft flies above highly-reflective objects, such as buildings, and metal pole tower.
- The return speed can be set to 12m/s for slightly weak reflective objects, such as glass buildings, trees, and telegraph poles.
- The return speed can be set to 7m/s in forests, brushes, and other scenarios with a large area of green plants.
- The return speed can be set to 5m/s in sparse vertical bars of obstacles, such as reinforcing steel bars in buildings under construction and sparse tress.
- The obstacle avoidance capacity during return will be sharply weakened at night. It is recommended to set the return speed to 5m/s at night.

Automatic return process

1. The aircraft records the HOME point.
2. Trigger automatic return conditions (by pressing the remote controller button trigger, or by a low power alert and lost communication).
3. The aircraft confirms the HOME point, and automatically adjusts the nose direction.
   a) When the horizontal distance between the aircraft and the HOME point is greater than 20m, and the actual altitude is higher than the pre-set return altitude, the aircraft will return at the current altitude; and if the actual altitude is lower than the pre-set return altitude, the aircraft will ascend to the return altitude before returning.
   b) When the horizontal distance between the aircraft and the HOME point is greater than 5m and less than 20m, and the actual altitude is higher than the pre-set return altitude, or the actual altitude is lower than the pre-set return altitude but greater than 20m, the aircraft will return at the current altitude; and when the aircraft altitude is less than 20m, the aircraft will ascend to 20m before returning.
   c) When the horizontal distance between the aircraft and the HOME point is less than 5m, click the return button to immediately land the aircraft in place, and the one-button landing can be interrupted.

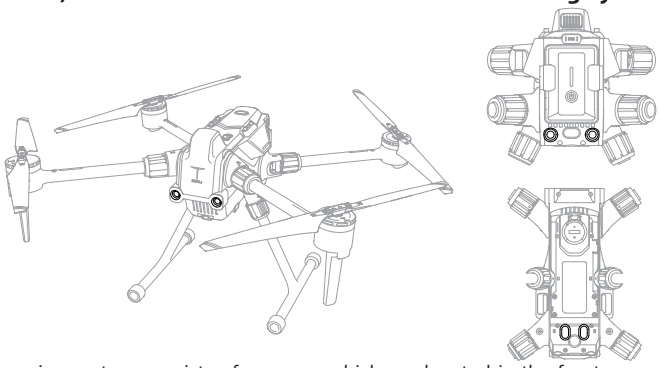
The text below uses the intelligent return process as an example for illustration.



⚠
- The user can toggle the control stick during the descending process to move the aircraft to a more Appropriate position before landing.
- The color range on the battery energy tank and the estimated remaining flight time information will be dynamically adjusted based on the aircraft's flight altitude and the distance to the HOME point.

Vision sensing system

Visual system, millimeter-wave radar and infrared sensing system



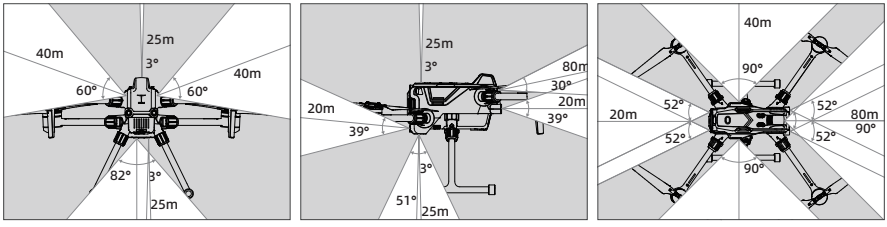
The vision sensing system consists of cameras which are located in the front, rear, and bottom of the aircraft fuselage, and are used for sensing the obstacles and position the aircraft through visual image ranging.

The millimeter-wave radars are located at the front, left, and right side of the aircraft fuselage and emit section electromagnetic wave for handling return signal and sense the obstacles.

The infrared sensing system is located at the rear, upper and lower part of the aircraft fuselage and is of the infrared TOF technology ranging to sense obstacles and the aircraft's flight altitude.

Detection range

The detection range of the visual system and the millimeter-wave radar are shown in the figure below. When the obstacle is outside of the sensor's detection range (white), the aircraft will be unable to sense the obstacle. The user should fly with caution, and pay attention to flight security.



Obstacle avoidance function

The obstacle avoidance function only works in standard mode. It is required to enable the visual obstacle avoidance in the GDU Flight II App. At the same time, the user should enable the obstacle avoidance strategy button, the aircraft will automatically brake when encountering an obstacle in the flight route.

⚠ • If the obstacle avoidance strategy button is not enabled, only the obstacle position will be displayed and only an alert will be prompted. However, the aircraft will not actively avoid obstacles.

Usage scenario of obstacle avoidance function

The visual obstacle avoidance is Applicable to well-lit scenarios, and the obstacles encountered on the flight route must not be too sparse. When the light is too dark, obstacle information is only provided through the millimeter-wave radar and the infrared sensor. It is recommended to set the aircraft's safety distance in the GDU Flight II App to be greater than 2.5 m. To obtain better obstacle avoidance experience, it is recommended to set the flight altitude to be greater than 10 m.

During manual flight, the user can freely control the aircraft. Therefore, the user should always pay attention to the flight speed and direction, and use the obstacle avoidance function Appropriately to prevent the obstacle from entering the sensor blind area, which may result in a collision.

When the aircraft is close to the obstacle, it will automatically brake in an urgent manner until hovering. After the aircraft is hovered, the user will be unable to get the aircraft close to the obstacle by pushing the control stick, and the user can push the control stick to fly the aircraft away from the obstacle to regain the control right.

Precautions for obstacle avoidance function usage

1. The visual system measurement is prone to be affected by the intensity of light and the texture of the surface. For example: When the obstacle surface is solid color with weak texture or strong reflection, the ambient light changes sharply and there is strong light, the obstacle is too tidy, or the visibility is too low, the visual system's obstacle detection will be affected or become invalid. Please use with caution.
2. The detection distance of the millimeter-wave radar depends on the obstacle size and material. For example: For strongly reflective objects (such as buildings, trees, telegraph poles), the effective detection distance is about 60m; for weak reflective objects (such as dead branches), the effective detection distance is 20m. Outside the effective detection distance, please use the radar with caution as the detection of obstacles may be affected or invalid.
3. The infrared sensing system must be used with large obstacles that have high reflectivity. For example: For obstacles with a strong absorption of light on surfaces, small obstacles, and transparent objects, please use the infrared sensor with caution because the detection of obstacles may be affected or invalid.

4. The obstacle avoidance function does not work indoors.

⚠
- lease make sure that the visual system camera lens is clear and clean. The shell case outside the radar module is clean and free of cracks, dents, or deformation.
- During usage, please do not cover the visual system camera and infrared ranging sensor, which will cause visual function errors and failure of the near-ground slow descent function, which will affect normal flight.
- If the fuselage is installed with other devices, please avoid covering the radar FOV. If the radar FOV is obstructed, the radar's obstacle sensing performance will be impaired. Please fly with caution.
- Maintain control over the aircraft throughout the flight process. Do NOT rely solely on the information provided by the GDU Flight II app. Please determine the aircraft's flight status based on observations using the naked eye and avoid obstacles in time.

Obstacle information display:

After the obstacle avoidance function is enabled in the App, a radar chart will Appear on the flight interface to display the detected obstacle.

When the obstacle distance is greater than the alarm distance, the obstacle is displayed as a green point.

When the obstacle reaches the alarm distance, it is displayed in yellow.

When the obstacle Approaches the obstacle avoidance braking distance, it is displayed in red.

The obstacle avoidance alarm distance and obstacle avoidance braking distance can be set in the GDU Flight II App.

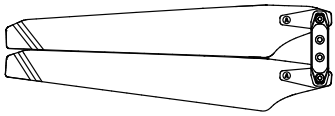
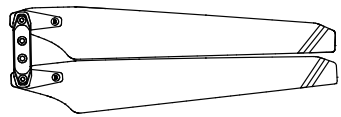
Flight data

The App has a flight data recording function. During use, flight logs are stored in the App and can be checked and exported using the remote controller App

Propellers

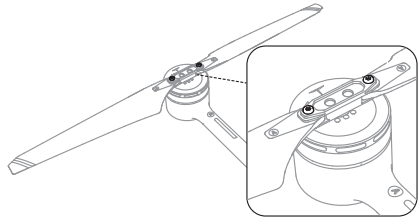
Propeller usage instructions

The aircraft is provided with 1866 propellers, which ensure takeoff and landing at an altitude of 5000 m. The wind speed in the flight environment should be ≤ 15 m/s.
The aircraft comes with folded propellers, which are divided into A propellers and B propellers. Please install them based on the markings on the corresponding motor.

Propellers	A propellers	B propellers
Schematic diagram		
Installation position	Installed to A arms	Installed to B arms

Replace propellers

Please use H2.5 internal hexagon head wrench to replace the propellers. It is recommended only to replace propellers in an emergency situation during a field operation. After an emergency flight, please contact GDU technical support for repair as soon as possible.



⚠
- Please use the propellers provided by GDU. Do not use propellers from different models.
- The propellers are consumables. If necessary, please purchase separately
- Before each flight, make sure to check whether the propellers have been installed correctly and firmly.
- Before each flight, make sure to check that the propellers are in good condition. Replace aged, damaged, or deformed propellers before the flight.
- DO NOT approach rotating propellers or motors to avoid injury.
- The propellers are thin and slightly sharp. Please operate with caution to avoid being scratched.
- Except in emergencies, do not replace propellers on your own. If required, it is recommended to return the product to the factory for replacement.

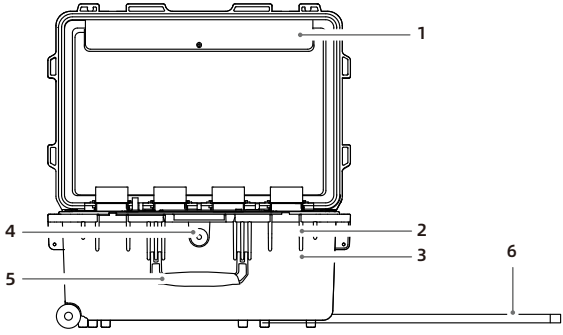
Intelligent battery pack

The battery pack has several battery ports and can charge up to eight PD12 intelligent batteries. The battery pack has a rod, making it easy to carry the pack outside.

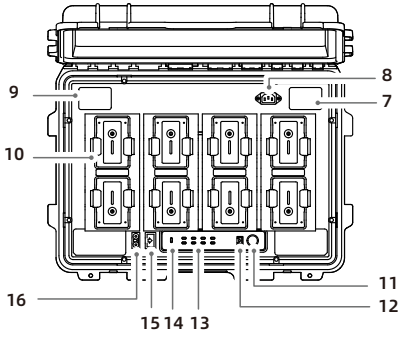
Precautions for Use

1. Keep the battery pack dry. Avoid water, oil and any other liquids.
2. Do not close the battery pack for charging. Please keep it in an area that is well ventilated and cool.
3. The battery pack is only applicable for PD12 intelligent flight batteries, remote controller, and pad. Do not use the battery pack to charge batteries from other models.
4. During usage, please place the battery pack flat and avoid insulation and fire protection.
5. Do not touch metal terminals with your hands or other objects. If the metal terminal has any foreign matter, please wipe them with a cloth.
6. Be careful when opening and closing the battery pack and extension rod to avoid being pinched.
7. Place the battery in the proper direction.
8. In the event of long-term air transportation or ambient pressure changes, internal air pressure inside the battery pack may change. At this point, the pressure equalizing valve will automatically adjust to balance the internal and external air pressure without manual adjustment.
9. Please use a dust remover for dust inside the battery pack.

Component description



1 Storage position of power cables
2 Padlock hole
3 Hasp
4 Pressure equalizing valve
5 Handle
6 Retractable rod

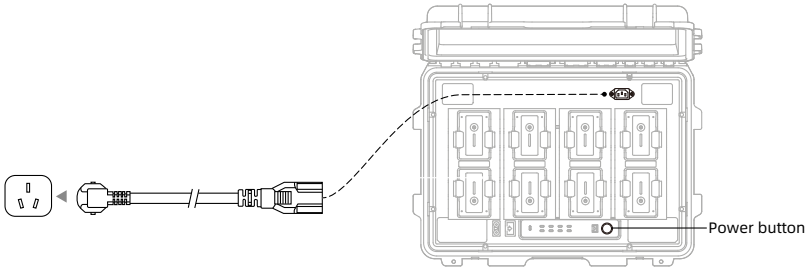


7 Air intake vent
8 AC 220V power interface
9 Air exhaust vent
10 PD12 battery interface
11 Power button
12 Firmware/software update interface
13 PD12 battery status indicator light
14 Alarm indicator light
15 USB charging interface
16 DC 12V charging interface

Use

Charging

Use an AC power cable to connect to the battery pack's power interface to an AC power (100-240Vac, 50-60Hz).



2.Press the power button to turn on the battery pack.

3. Insert a battery for charging.

It takes about 120 minutes to fully charge two PD12 intelligent batteries when using 100-240Vac power supply, and about 50 minutes to charge the batteries from 20% to 90%.

Specifications

Product model	ABP01
Dimensions	580mm* 420mm * 297mm
Empty box weight	15±0.05kg
Items that can be accommo-dated	PD12 intelligent batteries×8 pcs AC power cable, DC charging cable, USB charging cable
Input	90-264VAC，47-58Hz
Output	PD12 intelligent battery port: 26.4V, 14A×2 DC charging port: 12V, 3A×2 USB charging port: 5V, 3A×2
Output power	800W
Charging time	Two PD12 intelligent batteries can be charged at the same time, which take 110 min to fully charge them, and about 50min to charge the batteries from 20% to 90%.
Charging hub	Intelligently detect the battery level, and charge the high-battery level batteries at first.
Operating temperature	5℃~40℃
Protection functions	Anti-back flow protection, short-circuit protection, over-voltage protection, over-current protection, and over-temperature protection
Battery status display	Battery not connected-red light is solid on Battery connected but not charged-yellow light is solid on The battery temperature is abnormal-yellow light blinks Battery charging-green light blinks Battery fully charged-green light is solid on

Battery Pack LED Description

Buzzer prompt tone description

The buzzer prompt tone is mainly used for indicating an error:
When the alarm status indicator light is red, the buzzer beeps to prompt a battery pack hardware error.

LED indicator lights	Description
Power button indicator light	
Green indicator light is solid on	The battery pack is powered on.
Battery status indicator light	
Green indicator light is solid on	The charging is finished
The indicator light blinks green	Charging
Yellow indicator light is solid on	Ready-to-charge status
The indicator light blinks yellow.	Low temperature/high temperature alarm (1. The battery has low temperature. Charge it after the temperature has risen; 2. The battery temperature is too high and is cool-ing. Charge the battery after it has cooled to the proper temperature.)
Red indicator light is solid on	Battery malfunction (1. The battery is inserted reversely; 2. The battery is not fully inserted; 3. There is a battery communication error. Please use another charging interface;)
	The charging interface is malfunctioning. Please replace it.
Alarm indicator light	
The indicator light blinks red	Battery pack malfunction (1. The battery pack has low power voltage; 2. There is a power module communication error or some other issue; 3. The main board/fan is malfunctioning;)

⚠ • Please contact the after-sales or a local dealer.

Intelligent batteries

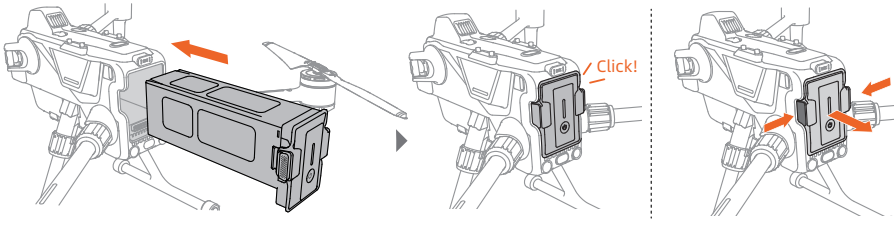
Introduction to intelligent batteries

The PD12 intelligent flight battery comes with a high-capacity cell and an advanced battery management system to power the aircraft. The intelligent battery must be charged with the special charger provided by GDU. Before its first use, be sure to charge the intelligent battery fully.

Intelligent flight battery function

1. Short circuit protection: When a short circuit is detected, the battery will automatically cut off output for protection.
2. Balanced protection function: Automatically balance the voltage of the internal cell to protect the battery. The battery has a static equalization and charging equalization function.
3. Overcharging protection: Overcharging will seriously damage the battery. When the battery is fully charged, it will stop charging.
4. Charging temperature protection: The battery will not begin charging at temperatures below 5°C or above 50°C because charging under such conditions will damage the battery.
5. Charging over-current protection: Current surges will seriously damage the battery. The battery will stop charging when the charging current is too high.
6. Overdischarging protection: Overdischarging will seriously damage the battery. When the battery is not operating during a flight, the battery will cut off output if the cell is discharged to 3.2V; when the battery is operating during a flight, overdischarge protection will not engage to ensure flight safety. When the battery is in flight discharge status the battery will turn off overdischarge protection to maintain continuous battery output, maximizing flight time in order to give the operator more time to land. Once this occurs, cell voltage is likely to be less than 2.5V due to overdischarging. Recharging an over-discharged battery may result in a serious fire risks. Therefore, when the voltage of a single cell is below 2.5V, the battery will be locked, prohibiting recharging. The battery can no longer be used. Therefore, please take careful note not to deliberately overdischarge the battery. In doing so the user takes the risk of severe battery damage. When the battery is overdischarged and locked, the battery level indicator lights will flash quickly after pressing the battery button.

Battery installation/removal

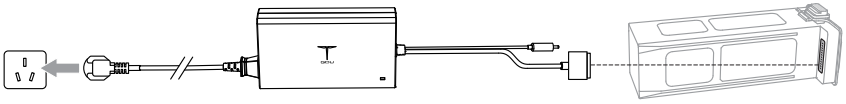


Battery installation

Battery removal

Charging

1. Remove the aircraft battery.
2. Input voltage: 26.4V
3. Charging time: 16400mAh battery ≤120 minutes

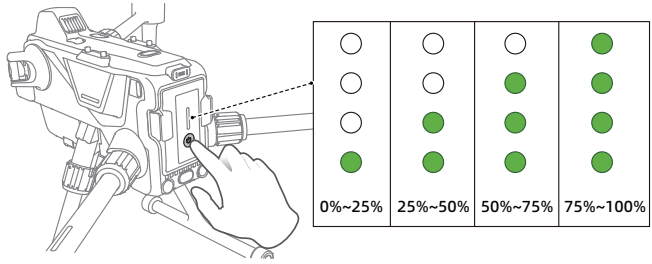


⚠ • Using this device in a residential environment may cause wireless interference.

Turn on/off the battery (with diagram changed)

Turn on the battery: When the battery is turned off, press the battery power button once, and the battery level LED indicator light blinks alternately. Press and hold the power button for 2 seconds to turn on the battery. When the battery is turned on, the battery level LED indicator lights light on from bottom to top in succession. The battery level LED indicator light displays the current battery level.

Turn off the battery: When the battery is turned on, press the battery power button once, and the battery level LED indicator light blinks alternately. Press and hold the power button for 2 seconds to turn off the battery. When the battery is turned off, the battery level LED indicator lights turn off from top to bottom in succession until all indicator lights are off.



ADS-B

The manned aircraft carrying an ADS-B emitter with broadcast automatic correlation monitoring will actively broadcast its own flight information. The GDU aircraft with ADS-B can receive flight information transmitted by the ADS-B emitter in compliance with 1090ES or UAT standards . Through the received flight information, ADS-B can analyze and obtain the position of manned aircraft, altitude, course, speed, and other information, and compare with the current position, altitude, course, speed information of the GDU aircraft for real-time calculation of the rough risk level of manned aircraft. Based on different risk levels, ADS-B sends different warning information to the user via the GDU Flight II App.

This module only sends warning information regarding the approach of a certain manned aircraft under specific circumstances and cannot actively control the GDU aircraft to avoid the approaching manned aircraft. The user should always fly the aircraft within their range of visibility and ensure flight safety. This module has the following restrictions:

1. This module can only receive information transmitted by manned aircraft with an ADS-B out in compliance with 1090ES (RTCA DO-260) or UAT (RTCA D0-282). For manned aircraft not equipped with an ADS-B out or the manned aircraft that have been equipped with an ADS-B out but fails to work, this module cannot receive related broadcast information and send warning information.
2. This module functions based on wireless frequency. If there are any obstructions between the GDU aircraft and the manned aircraft, this module will be unable to effectively receive the broadcast information and send warning information.
3. Due to the change and interference of the surrounding environment, this module is likely to delay the transmission of warning information. As such, please fly with caution and keep an eye on surrounding environments.
4. When the GDU aircraft cannot effectively obtain its position, there may be an error with the warning information sent by this module.
5. When this module is powered off or does not work, it will be unable to receive the broadcast information sent from the manned aircraft, and therefore cannot send any warning information. When the ADS-B system determines that there are any risks, it will send 3 levels of alerts based on the distance between the UAV and manned aircraft. When the user receives an alert, please land the aircraft immediately or avoid the obstacles through other methods.
   a) Level 1 alert: All flights searched by the UAV will be displayed in the app (Up to 10 flights can be displayed at the same time). Please pay attention to flight safety;
   b) Level 2 alert: There may be a manned aircraft passing by within the 2km range of the UAV. Please pay attention and avoid the aircraft;
   c) Level 3 alert: There may be a manned aircraft passing by within the 1km range of the UAV. Please pay attention to avoiding;

When a Level 1, Level 2, and Level 3 alert is given, a blue, yellow, and red aircraft icon will appear on the map page respectively.

Blue: Level 1 alert

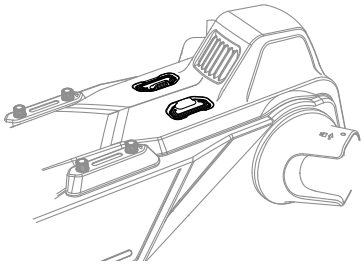
Yellow: Level 2 alert

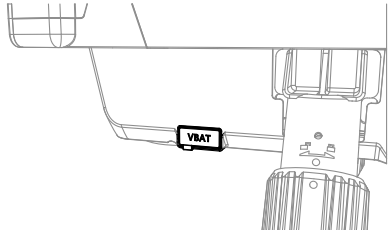
Red: Level 3 alert

⚠ • ADS-B function is only available when the ADS-B module is added.

Multiple expansion devices

The aircraft has several SDK extension interfaces and can support a variety of expansion devices. The list of expansion devices is as follows: Night navigation light, rear RTK, FPV single upward gimbal component, LTE backup video transmission, and downward multi-payload component.





⚠ • Either a night navigation light or a parachute can be selected, as well as an FPV or a downward multi-payload component.

IP45 description

1. DO NOT fly the aircraft when the precipitation level is higher than 100mm/24h.
2. DO NOT fold the arms when it is raining.
3. Before a flight, please check that the battery port, battery compartment port, battery surface, and battery compartment surface are dry, and then insert the battery into the aircraft;
4. Make sure that the battery port and surface are dry before charging.
5. Please wipe the aircraft's surface, and ensure that there are no droplets before putting it into the package.
6. Damage caused by liquid influx is not covered by the warranty.

IP45 is not applicable to the following circumstances:

1. The arms are folded;
2. The port protective cover is not mounted properly;
3. The upper cover's dust-proof rubber falls off;
4. The aircraft has other possible damages, such as a cracked shell, waterproof glue failure, etc.

Remote Controller

This chapter introduces the various functions of the remote controller, including its set-up and aircraft controls.

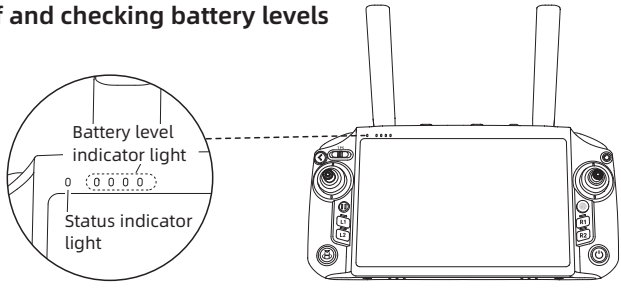
Remote Controller

Remote controller overview

GDU RC SEE is a highly-integrated remote controller with a highlight screen. The product comes with an Android 9.0 or above platform system and is capable of local storage and data analysis. It is an intelligent remote controller with a remote networking data link that integrates mobile public network access, GPS positioning and local LAN connection. The product's interaction interface has a humanized design and rich extension interfaces; it is capable of video post-processing and the local and external output of videos; it also supports secondary development and can quickly achieve the professional Application of UAV products.

Preparation of the remote controller

Powering on/off and checking battery levels



1.Status indicator light

For specific meanings, please refer to the table below:

Status indicator light	Description
Red indicator light is solid on	The remote controller is powered on and the aircraft is not connected.
The indicator light blinks red	Slow blink: excessive temperature of remote controller
The indicator light blinks red	Quick blink: aircraft low battery alert
Green indicator light is solid on	The aircraft is connected.
The indicator light blinks blue.	The remote controller and aircraft are being paired.
Yellow indicator light is solid on	Firmware update fails.
The indicator light blinks yellow.	Low battery alert of remote controller
The indicator light blinks cyan.	The remote controller's control stick is not re-centered.

2.Battery level indicator light

The battery level indicator light indicates the aircraft's battery level.
For specific meanings, please refer to the text below:

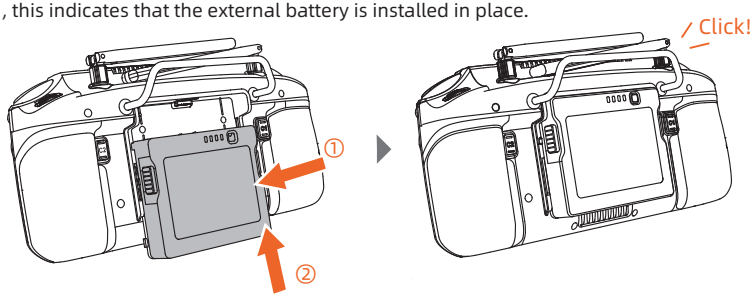
1. When the four indicator lights are all on, this indicates that the battery level is full as fed back by the aircraft. The indicator lights turn off in succession based on battery level consumption;
2. When the aircraft's battery level is lower than 20%, the last indicator light blinks 3s once; when the battery level is lower than 5%, the indicator light blinks 1s once.
3. When the remote controller battery is being charged, the battery level indicator lights blink alternately to indicate that the remote controller is being charged. The battery level indicator lights are continually lit after discharging ends, and blink once together with an interval of 3s.

Blinking method	Remaining battery
● ● ● ●	75%~100%
● ● ● ○	50%~75%
● ● ○ ○	25%~50%
● ○ ○ ○	0%~25%

Installing an external intelligent battery

If an external battery for the remote controller is to be purchased separately, please refer to the steps below for installation.

Insert the external battery into the battery compartment and push it to the top. When a "click" sound is heard, this indicates that the external battery is installed in place.



⚠ • To remove the external battery, press the battery's unlock button and push it downwards.

Installing a strap support kit

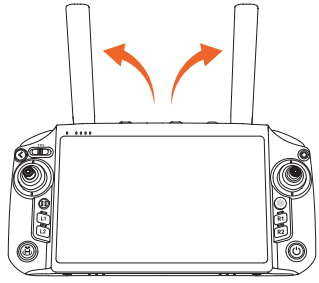
1. Install the two triangular ring screws on the remote controller.
2. After the strap is attached, pass the two ends through the triangular rings for installation.

⚠ • After use, hold the remote controller with one hand first, release it with the other hand and take off the strap.

Adjusting the antenna

Unfold the remote controller antenna and adjust it to an Appropriate position. The strength of the received signal varies across different antenna positions.
Based on the relative position between the remote controller and the aircraft, adjust the orientation of the external antenna of the remote controller and align the antenna plane against the aircraft's direction to achieve the optimal status of the remote controller and aircraft signal quality.

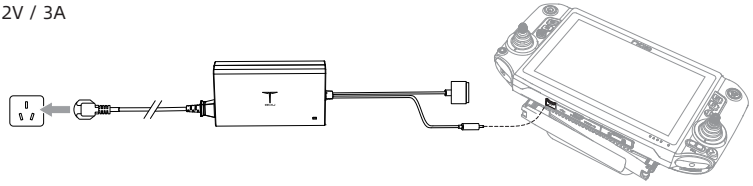
⚠ • When the antenna is adjusted to the limit, do not use great force to avoid antenna damage. Damaged remote controller antennas may affect the product's performance and safety. Please contact the GDU technical support in time.
• Do not use another communication device in the same frequency band (2.4 GHz or 5.8 GHz) during flight as this may interfere with the remote controller's signal. For example: turning on your mobile phone's Wi-Fi.



Charging the remote controller and checking the battery level

When charging the remote controller, the user can determine whether the battery is fully charged based on the remote controller's indicator light color. When the white indicator lights blink in succession, this indicates that the battery is being charged; when the white indicator lights are continually lit, this indicates that the battery is fully charged.

It takes Approximate 2.2 h to fully charge the internal battery of the remote controller using the official DC charger (7000 mAh@7.2 V) when the remote controller is powered off at normal temperature. Input: 12V / 3A



⚠
- Be sure to use an original charger to charge the original battery and remote controller. Alternatively, use a charger provided by GDU to charge the battery. GDU takes no responsibility for any product fault or damage caused by using non-original accessories.
- To maintain the optimal remote controller battery status, please fully charge the remote controller every 3 months.

Charging description

There are two charging methods for the internal battery:

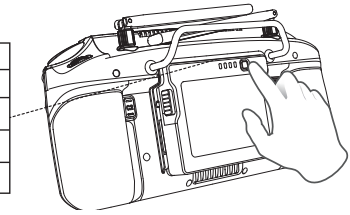
1. Fast charging 1: DC port, 12V / 3A,0~90% battery level: 1.5 h, 0~100%full battery level: 2.2 h;
2. Fast charging 2: USB-C port 12V / 3A, 90% battery level: 1.8 h, 0~100%full battery level: 2.5 h (the adapter must support the 12 V fast charging port and QC protocol, and the output power level must be > 45 W).

It takes 3.5 h to charge two batteries at the same time from 0% to 100% when an external battery charging base (DC fast charging) is connected.

Checking the power level of the internal battery

Press the external battery button for the battery level to be presented in the form of an LED indicator light.

Blinking method	Remaining battery
● ● ● ●	75%~100%
● ● ● ○	50%~75%
● ● ○ ○	25%~50%
● ○ ○ ○	0%~25%



Low battery alert

Low battery alert of remote controller: a single beep	
The battery level is lower than 15%.	The beeper sounds once for 10 s.
The battery level is lower than 5%.	The beeper sounds once for 3 s.
The battery level is lower than 2%.	The beeper alarms once for 1 s.
Low battery alert of the aircraft: two beeps	
The battery level is lower than 20%.	The beeper sounds once for 10 s.
The battery level is lower than 5%.	The beeper sounds once for 3 s.
The battery level is lower than 2%.	The beeper alarms once for 1 s.