

Richen Power

Y20

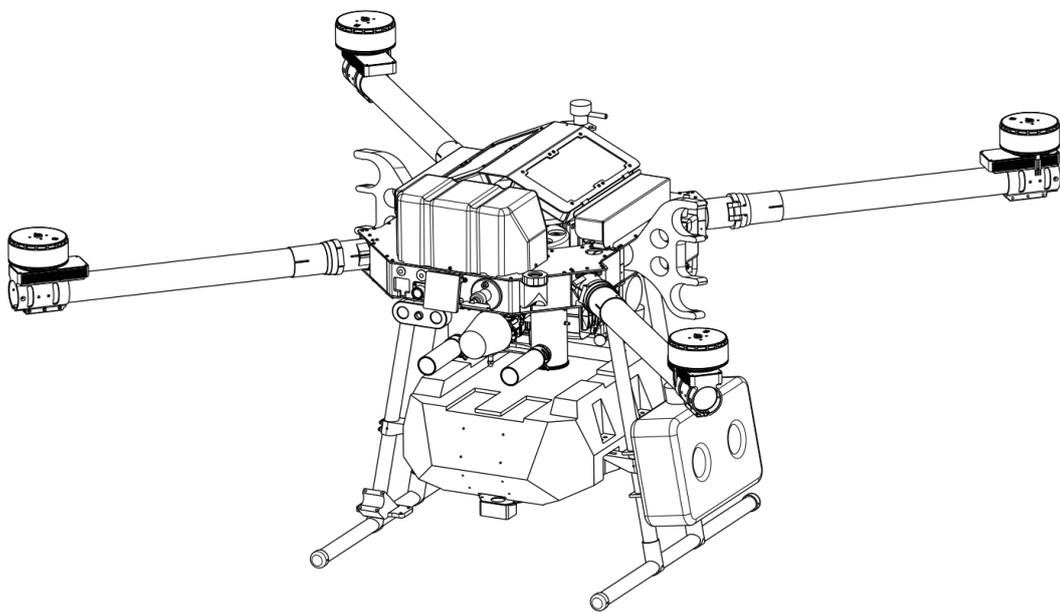
Hybrid Agricultural Drone

3WWYZ-16A

**user manual**

V1.0

2023.8





## Searching for Keywords

Searching for keywords such as “fuel” and “App” to find a topic. If you are using Adobe Reader to read this document, press Ctrl+F on Windows or Command+F on Mac to begin a search.

## Navigating to a topic

View a complete list of topics in the table of contents. Click on a topic to navigate to that section.



## Print this document

This document supports high resolution printing.



## Information

1. Lipo battery is integrated. Take necessary precautions when handling the battery to ensure your own safety. Richenpower assumes no liability for damage or injury incurred directly or indirectly from misusing battery.
2. In this document, the altitude limits of 20 m means the altitude between the aircraft and the surface of the objects below it when the altitude stabilization function of the radar module is enabled. If the function is disabled, the altitude limit means the altitude between the aircraft and the takeoff point.

## Using This Manual

### Legend



Important



Hints and tips



Reference

### Before Flight

The following documents have been produced to help you safely operate and make full use of your aircraft:

1. In the box
2. User Manual

Check the listed parts refer to In the Box and read the disclaimer and safety guidelines before flight. Refer to the User Manual for more information on use and maintenance.

### Downloading User Manual

<https://www.richenpower.com/download>

# Safety

## 1. Pesticide Usage

- Avoid the use of powder pesticides as much as possible as they may reduce the service life of the spraying system.
- Pesticides are poisonous and pose serious risks to safety. Only use them in strict accordance with their specifications.
- Residue on the equipment caused by splashes or spills when pouring and mixing the pesticide can irritate your skin. Make sure to clean the equipment after mixing.
- Use clean water to mix the pesticide and filter the mixed liquid before pouring into the spray tank to avoid blocking the strainer. Clear any blockage before using the equipment.
- Make sure to stay in an upwind area when spraying pesticide to avoid bodily harm.
- Wear protective clothing to prevent direct body contact with the pesticide. Rinse your hands and skin after handling pesticides. Clean the aircraft and remote controller after applying the pesticide.
- Effective use of pesticides depends on pesticide density, spray rate, spray distance, aircraft speed, wind speed, wind direction, temperature, and humidity. Consider all factors when using pesticides, but DO NOT compromise the safety of people, animals, or the environment in doing so.
- DO NOT contaminate rivers and sources of drinking water.



Y20 is not a toy and is not suitable for children under the age of 18.

Note that the Safety section only provides a quick overview of the safety tips. Make sure you read and understand this document and the user manual.

## 2. Operation

- Stay away from the rotating propellers and motors.
- The takeoff weight must not exceed 38 kg when using near sea level. Note that when using at a higher sea level, the takeoff weight capacity will be reduced.
- Maintain a visual line of sight (VLOS) of your aircraft at all times.
- DO NOT use the Combination Stick Command (CSC) or other methods to stop the motors when the aircraft is airborne unless in an emergency situation.
- DO NOT answer incoming calls during flight. DO NOT fly under the influence of alcohol or drugs.
- If there is a low battery warning, land the aircraft immediately at a safe location.

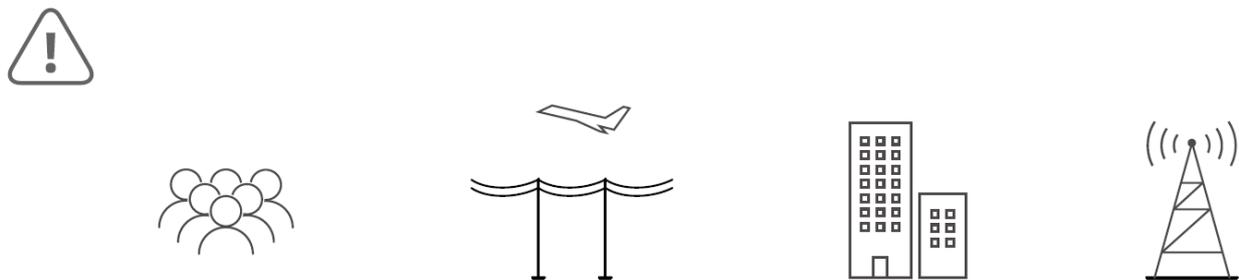
## 3. Maintenance and Upkeep

- DO NOT use aged, chipped, or broken propellers.

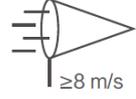
- To avoid damaging the landing gear, remove or empty the spray tank and fuel tank during transportation or when not in use.
- Recommended storage temperature (when the spray tank, flow meter, pumps, and hoses are empty): between -20° and 40°C (-4° and 104°F).
- Clean the aircraft immediately after spraying. Inspect the aircraft regularly. Refer to the Product Care section of User Manual for more information about maintenance guidelines.

4. Observe Local Laws and Regulations

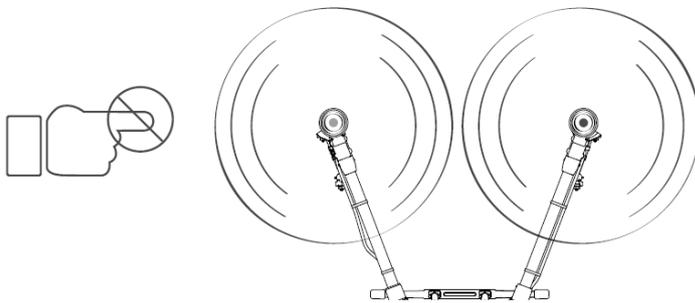
- You can find a list of GEO zones at <https://www.dji.com/flysafe>. Not that the GEO zones are not a replacement for local government regulations or good judgment.
- Avoid flying at altitudes above 20m (65ft). The altitude limit of 30 m means the altitude between the aircraft and the surface of the objects below it when the altitude stabilization function of the radar module is enabled. If the function is disabled. The altitude limit means the altitude between the aircraft and the takeoff point.



Avoid flying over or near crowds, high voltage power lines, or bodies of water. Strong electromagnetic sources such as power lines, base stations, and tall buildings may affect the onboard compass.



DO NOT use the aircraft in adverse weather conditions such as winds exceeding 28 kph (17 mph), heavy rain (precipitation rate exceeding 25 mm (0.98 in) in 12 hours), fog, snow, lightning, tornadoes, or hurricanes.



Stay away from the rotating propellers and motors.



GEO Zones

Learn more at:  
<http://www.dji.com/flysafe>

## Maintenance

Proper maintenance is necessary to keep the aircraft in order. Inspect and maintain the aircraft regularly. Incorrect maintenance can shorten the life of the aircraft and even lead to crash.

### 1. Frame

- Please check before each flight and replace the deformed or damaged propeller. Deformed, cracked, broken propellers should be replaced.
- Check the propellers with your hands before each flight, whether they rotate smoothly without noises.
- Always empty the fuel tank when not in duty or during transport.
- Recommended storage temperature (when the spray tank, flow meter, pumps, and hoses are empty): between -20° and 40°C (-4° and 104°F).
- Clean the aircraft immediately after spraying. Inspect the aircraft regularly. Use a wet towel to clean the propellers, motors, and drone frame. Do not wash with high-pressure water. Use a toothbrush to dispose of clogged spray nozzles. If

herbicides and others that cause phytotoxicity, soak the medicine box and spray system with detergent for 12 hours and clean with clean water.



- Engine and frame require Overhaul every 300 hours (hours to service displayed on App screen). Contact your dealer.

Maintenance	Every 50 hours	Every 100 hours	Every 300 hours
Air intake filter	Replacement	Replacement	Replacement
Spark plug	---	Replacement	Replacement
Fuel filter	---	Replacement	Replacement
Engine & drone overhaul	---	---	Overhaul

## 2. Hybrid engine

- Use AG Drone 2 stroke Oil from your dealer or order YAMALUBE TC-W3 2 stroke in your market. Mix #92 E92 regular or above automotive gasoline with oil at ratio of gas: oil 40:1. The fuel mixer helps mixing. Use other oil, wrong gasoline, or wrong mix ratio may damage the engine. And it is out of warranty.
- Every 50 hours replace air intake filter. Every 100 hours replace sparks and fuel filter. Hours to service displays on App screen. Operation under dusty environment will shorten the service cycle. Replace the air intake filter immediately if there is visible soil or dust on the filter. Same for the spark plugs and fuel filter.
- Storage. Empty the Spray tank and Fuel tank. Clean the Spray system with clean water. Start the engine every three-month (3) to maintain the battery automatically.

# CONTENT

Information	1
Using This Manual	1
Legend	1
Before Flight	1
Downloading User Manual and Smart Phone App (Android)	1
Safety	2
Maintenance	4
Preparing the Aircraft	8
In the Box	8
Very Important (Read before Use)	9
Flight Safety	9
How to avoid crash	9
Object Avoidance & Terrain Sensor Settings	10
<b>SAFETY FIRST!</b>	10
Open the Box	12
Unfold Arms	12
Prepare the Fuel	12
Flight Operation	13
Remote Controller	16
Profile	16
Use the Remote Controller	16
Charging the Remote Controller	17
Operating the Aircraft	17
Spray Operation	19
Return (RTH) Button	20
Circumvent Obstacles during RTH	20
Optimal Transmission Zone	20
Linking the Remote Controller	20
App	21
APP Screen	21
Plan View (Autonomous Missions)	22

Operation Resumption	23
Radar	24
Empty Tank	27
Operation Environment	27
Operation Environment	27
Flight Limits and GEO Zones	28
Calibration	30
Calibrating the IMU Horizontal Level Horizon	30
Calibrating the Compass (no need to do)	31
Appendix	32
Specifications	32
Hybrid System LED Indicator Description	33
List of Hazards and solutions	33
Contact us	35

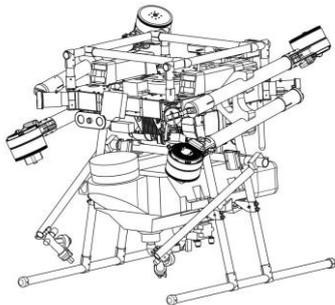
# Preparing the Aircraft

## In the Box

### Y20 Hybrid Agricultural Drone

Check the listed parts refer to In the Box and read the disclaimer and safety guidelines before flight.

Y20 AG drone x1  
With spray system, liquid tank and propellers



Remote controller x1  
With 2 data wires



Start Box x1



Fuel mixer x1  
5 liters capacity



Pellets Spreader (optional)\*



\*alternative items are not in the package. Optional item needs ordering. Please choose fuel oil as synthetic MOTUL710 2T, Castrol 2T, Total synthetic 2T or Torco synthetic.

Downloading User Manual

<https://www.richenpower.com/download>

and Smart Phone App (Android 64 bit APK)

[https://docs.qgroundcontrol.com/master/en/getting\\_started/download\\_and\\_install.html](https://docs.qgroundcontrol.com/master/en/getting_started/download_and_install.html)

## Very Important (Read before Use)

### Flight Safety

1. Y20 is not a toy and is not suitable for children under the age of 18. The pilot must hold license.
2. The takeoff weight must not exceed 32 kg when using near sea level. Keep at least 20 meters distance to people, vehicles and power facilities during takeoff and landing.
3. Remote controller is default as '**Mode 2 (left throttle)**', make sure in App ... and RC controller setting  before takeoff.
4. Be sure to monitor the aircraft at all times and be ready to take over at any time. Chatting and making calls are strictly prohibited. Refill the pesticide and fuel after the aircraft landed.

### How to avoid crash

1. Do not modify App settings.
2. Plan a field with by walking with remote controller instead of flying the aircraft or map plan.
3. When mark obstacles in a target field, the outlining areas of obstacles should be at least 5 meters away from obstacles. The red outline of obstacles must be inside the target field. After a flight route produced, make sure any route goes around the obstacle instead of through it. Y20's spray width is 8 to 10 meters. Therefore, closely bypass obstacles is not necessary. Always fly away from obstacles.
4. Reduce the AB route as much as possible.
5. Continue to use cracked and broken propellers will cause greater losses. Keeping away from obstacles is an effective way to protect the propeller.
6. When there are obstacles such as trees or telephone poles at the field boundary, set the field edge at least 8 meters away from the obstacle.
7. Practice has shown that repeated reading of the previous "Safety" and "Maintenance" sections and maintenance before and after each flight can effectively reduce crashes.
8. Always pay attention to the voltage, when the voltage continues to be lower than 46V,

the amount of liquid should be reduced. The liquid load is also affected by the altitude, the **liquid load is 12 liters at an altitude of 1400 meters, and only 8 liters at an altitude of 2000 meters.**

9. No obstacles will be Auto bypassed when returning home, obstacle avoidance radar and remote control stick will still work. Please always monitor the aircraft.

## Object Avoidance & Terrain Sensor Settings

### SAFETY FIRST!

- OBJECT AVOIDANCE

Horizontal object avoidance works in AltHold and Loiter modes. Upward avoidance needs extra sensors.

Avoidance control enable/disable:

- i. Button "SW3", or
- ii. AVOID\_ Parameters:  
    AVOID\_ENABLE=0 (OFF)  
    AVOID\_ENABLE=1 (ON)

Avoidance Settings:

    AVOID\_MARGIN=8 (Vehicle will attempt to stay at least this distance (in meters) from objects while in GPS modes)

    AVOID\_BEHAVE=1 (Stop)

In AUTO, GUIDED, and RTL flight modes:

<https://ardupilot.org/copter/docs/common-oa-bendyruler.html#common-oa-bendyruler>

- Terrain (Altitude Maintain)

It's not safe to enable Terrain (Altitude Maintain) above trees. The drone will go up and down when cruising above trees. Therefore it is disabled for Y20.

To enable:

PRX1\_type = 4

PRX2\_type = 4

PRX3\_type = 4

RNGFND1\_TYPE=25 (BenewakeTFminiPlus-I2C)

- ZigZag mode:

Back and forth across a field (for crop spraying)

<https://ardupilot.org/copter/docs/zigzag-mode.html?highlight=zigzag>

- High Temperature:

We strongly recommend avoiding heating. High temperature with low air density can lead to overload on the motor and generator. The recommended maximal load above 35 °C is 16 Liters.

## Open the Box

The aircraft is dissembled in box. Re-assemble the arms and landing gear with same numbers stuck on the parts. Reconnect the connectors. Assemble the propellers with same numbers on the motors. Check to make sure the radar mounting bracket and the landing gear are properly secured. Be careful before the first flight. Contact us if anything is uncertain.



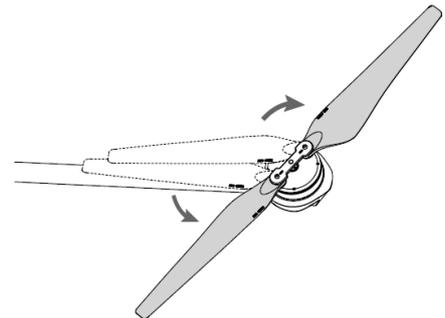
- Each drone you received has been tested for flight before shipping out to ensure normal use.
- All pipes and plugs are connected.
- Each engine has been run in and can be used directly.
- 'Horizontal Calibration' is required before first flight or after long distance transportation further than 600 kilometers (373 miles).

## Unfold Arms

1. Unfold all arms and tighten the six arm sleeves.
2. Unfold propeller blades.



Check to make sure no blade cracked or damaged. A propeller with a crack on the leading edge or root has a risk of breaking during flight, resulting in a crash.



## Prepare the Fuel

1. Fuel Mix. (Regular #92) Automotive gasoline to oil at ratio of 25:1. It is light red after mixing. Two-stroke oil must be used, otherwise the engine will be damaged. Please buy 'Two-stroke engine oil for drones' at dealer's.
2. Refill. The capacity of fuel tank is 4 liters.
3. The displays 'Fuel Level' on App.
4. Please choose fuel oil as synthetic Castrol 2T,  
Total synthetic 2T, Motul710 or Torco synthetic.



## Flight Operation

1. Before the first flight, please read the following instructions about the remote control and APP in detail.

2. Outline target field, obstacles.

3. Open App QGC.

4. Switch on the aircraft and connect to App.

The Communication between RC controller and Y20 is preset. If the connection is lost, please check the settings on QGC App:



Waiting For Vehicle Connection

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常规

通讯连接

离线地图

MAVLink

控制台

帮助

**视频**

视频来源	RTSP Video Stream
RTSP URL	i54/cam/realmonitor?channel=1&subtype=2
长宽比	1.777777
解锁后禁用	<input type="checkbox"/>
Low Latency Mode	<input type="checkbox"/>

**视频录制**

自动删除文件	<input checked="" type="checkbox"/>
最大存储使用量	2048 MB
视频文件格式	mkv

QGroundControl 版本

Video RTSP URL:

rtsp://192.168.0.10:8554/H264Video



## Comm Links



Monitor your vehicle(s) while flying, including streaming video.

5. Tap  icon to Plan and Create autonomous missions.

6. Start the generator engine, Press to start ONLY when LED is solid green or flashing green (picture above)

7. Monitor if any warning symbol is lighted on top of App. Confirm the number of satellites is greater than 25 3D or 13 RTK. Confirm the Terrain radar is on and height shows 0.3~0.4 meter.  Shows you progress of RTK GPS Survey-In process.

Make sure no warning sign displayed on screen.

Manually start the motors by Combination Stick Command (CSC) in the remote control.

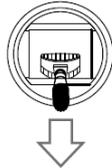


The default take-off hover height is '1.5 meters' from the ground.

## Starting the motor CSC

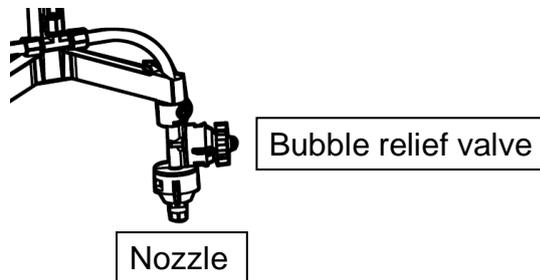
8. Switch the 'Flight Mode' to 'Auto', the aircraft enters the autonomous operation mode. NOTE: the flying height must be set before operation. The height cannot be adjusted during flight with throttle stick.

9. The aircraft hovers after the operation was completed. Press the 'RTL' button or tap 'RTL' on the APP. The aircraft will return and land automatically. The obstacles avoid in flight route does NOT work during RTH (Return to Home), please pay attention to the aircraft at all times, and be prepared to switch 'Flight Mode' to 'Loiter' for emergency stop. Operate the remote control to lift or move the aircraft left and right. After returned to the take-off point, the aircraft will hover, tap the 'landing' button, the aircraft automatically landed and locked. You can also operate the remote control to land in 'Loiter' mode. Pull the throttle all the way until the propeller stopped.



Throttle Stick down (left stick in Mode 2) or Stopping the motor CSC

10. Approach the aircraft ONLY when propellers completely stopped. During the liquid tank replacement, the engine automatically enters the idle mode. Switch OFF is not necessary. After liquid tank replacement, make sure the sprinkler hoses are clear from bubbles. Discharge any bubbles as they may affect the performance of the sprinkler. Loosen the bubble relief valve and start the pump. Next, tighten the valve and the sprinkler will work properly.



Turbo Nozzles do NOT need bubble relief.



- Effective use of pesticides depends on pesticide density, spray rate, spray distance, aircraft speed, wind speed, and wind direction. Consider all factors when using pesticides.
- The wind field of the aircraft is twice that of the ordinary one. To avoid damage, the recommended operation height is 2 ~ 3 meters above crops.

## Remote Controller

### Profile

The remote controller use 2.4GHz dual-band image transmission system, which has a maximum control distance of up to 1.24 mi (2 km). A smart phone or pad (Android Only) and internet connection are required. The remote controller is configurator and tested before shipping. Please do NOT modify the settings.



Stick mode: default (Mode2) and can be set to mode 1 in App.

**Mode 2:** the left stick serves as the throttle.

**Mode 1:** the right stick serves as the throttle.



- Other RC devices may cause interference to the remote control signal.
- To avoid interference between operations, do not operate more than three aircrafts within a 50 m radius.

### Use the Remote Controller

#### Turning the Remote Controller On and Off

The remote controller integrates a 4000mAh 1S chargeable battery.

1. When the remote controller is turned off, press the Power button once to check the current battery level.  
If the battery level is too low, charge before use.
2. Press the Power button once, then press and hold to power on the remote controller.
3. Repeat Step 2 to turn off the remote controller.



Use the H16 APP to modify the RC. For advanced settings such as Channel definition, please enter the password '999'.

Button Definitions:

A – F: Althold, Loiter, Auto, ZigZag, RTL, Land

SW1: ZigZag WP B, -- , ZigZag WP A

SW2: ZigZag Auto

SW3: Avoidance Enable

SW4: Sprayer

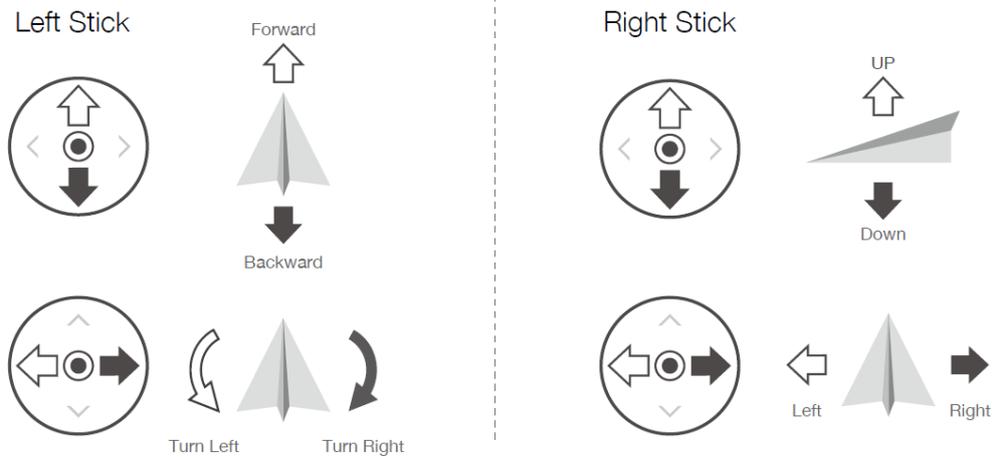
Charging the Remote Controller

Charge the battery with a standard Type C 5v/1.5A wire. (E.g. phone or camera USB)

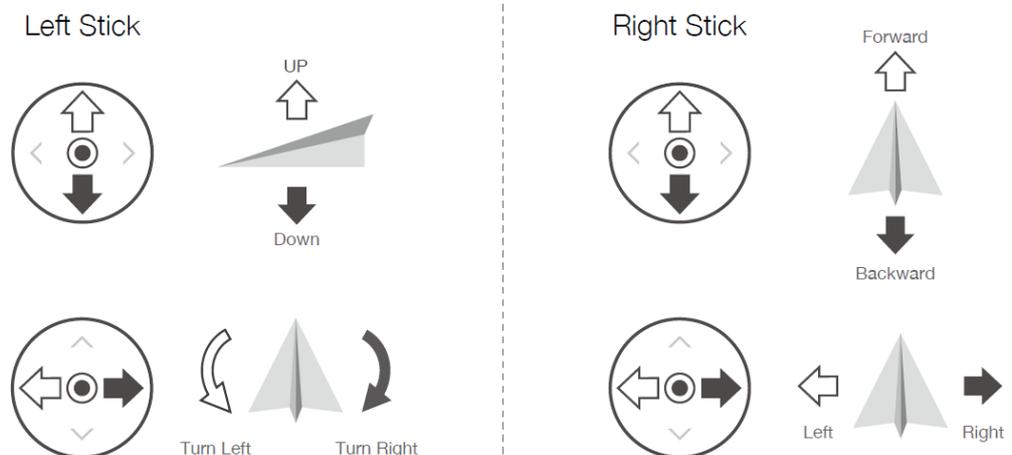
Operating the Aircraft

Control can be set to Mode 1 or Mode 2.

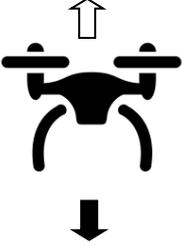
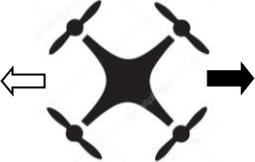
Mode 1



Mode 2



For example, the following description uses Mode 2:

Remote Controller (Mode 2)	Aircraft	Remarks
		<p>Throttle Stick: move the left stick vertically to control the elevation of the aircraft.</p> <p>Push up to ascend and push down to descend. Use the left stick to take off when the motors are spinning at an idle speed. The aircraft hovers in place if the stick is in the center position. The further the stick is pushed away from the center position, the faster the aircraft changes elevation.</p>
		<p>Yaw Stick: move the left stick horizontally to control the heading of the aircraft.</p> <p>Push left to rotate the aircraft counterclockwise and push right to rotate clockwise. The aircraft hovers in place if the stick is in the center position. The further the stick is pushed away from the center position, the faster the aircraft rotates.</p>
		<p>Pitch Stick: move the right stick vertically to control the pitch of the aircraft.</p> <p>Push up to fly forwards and press down to fly backwards. The aircraft hovers in place if the stick is in the center position. Push the stick further for a larger pitch angle and faster flight.</p>
		<p>Roll Stick: move right control stick horizontally to control the roll of the aircraft.</p> <p>Push the stick left to fly left and right to fly right. The aircraft hovers in place if the stick is in the central position. Push the stick further for a larger roll angle and faster flight.</p>

## Spray Operation

Complete an operation remotely via the flight mode/ stop switch, spray button, Return (RTH) button and A/B switch.

### 1 Flight mode/ stop switch

During Auto or A-B Route operation, switch Flight mode can stop the current operation. The aircraft hovers in place but does not record a Breakpoint. The pilot can operate the aircraft manually. Tap Resume Mission on App to resume the operation from returning to the Waypoint. Tap Resume at right side of screen to continue the operation, the Route or A-B Route will continue. The pilot can operate the aircraft manually.

The current flight mode is displayed on the upper left corner of App.

### 2 Spray Rate

This feature allows an autopilot connected to a PWM operated pump and (optionally) spinner to control the rate of flow of liquid fertilizer based on the vehicle speed. Monitor and adjust the current spray rate\* through the App.

<https://ardupilot.org/copter/docs/sprayer.html?highlight=spray>

\*Spray rate may vary according to the nozzle model and viscosity of the liquid.

### 3 Spray Button

In Loiter/ZigZag/Auto Mode or on the ground, press to start or stop spraying.

### 4 A/B Switch (ZigZag mode)

ZigZag mode is a semi-autonomous mode designed to make it easier for a pilot to fly a vehicle back and forth across a field which can be useful for crop spraying. In ZigZag Mode, switch to the right to record Point A and to the left to record Point B. The point A and B will be displayed on App. More details:

<https://ardupilot.org/copter/docs/zigzag-mode.html?highlight=spray>

## Return (RTH) Button

Press the Return (RTH) Button on remote controller to bring the aircraft back to the last recorded home point. Users can control the aircraft during the RTH. Press the B (Loiter) button to cancel RTH and regain control of the aircraft.

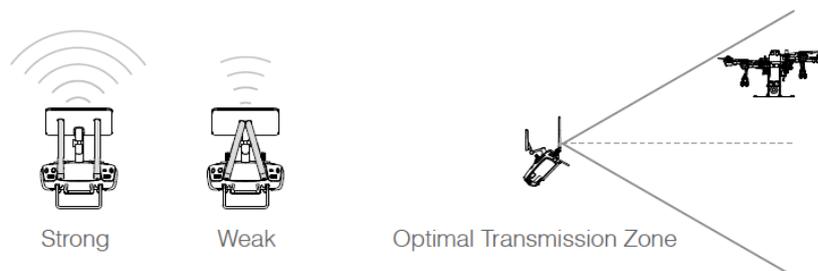
## Circumvent Obstacles during RTH

The aircraft can detect obstacles while Obstacle Avoidance is active in forward or backward direction according to the direction of flight. The aircraft will decelerate and then stop and hover if there is an obstacle within 20 m. If the aircraft comes within 8 m of the obstacle while decelerating, the aircraft stops, flies backward to a distance of approximately 8 m from the obstacle, and hover. More details about simple object avoidance:

<https://ardupilot.org/copter/docs/common-simple-object-avoidance.html>

## Optimal Transmission Zone

Optimal Transmission Zone



The strength of the remote controller signal is affected by the position of the antennas. The recommended position is perpendicular to the ground. Try to keep the aircraft inside the optimal transmission zone. If the signal is weak, adjust the antennas or fly the aircraft closer.

## Linking the Remote Controller

The remote controller is linked to the aircraft by default. Linking is only required when using a new remote controller for the first time.

# App

App is designed for agricultural applications and is able to display the system status and configure various settings. After planning a field via the intelligent operation planning system of the App, the aircraft can operate automatically following the pre-planned flight route.

## APP Screen

### 1. App Screen



More details about FLY VIEW:

<https://docs.qgroundcontrol.com/master/en/FlyView/FlyView.html>

### Status icons

Status icons are displayed when *QGroundControl* is connected to a vehicle. These show the high level status of the vehicle, and can be clicked to see more detailed information.

### Vehicle Messages

Click to show a list of messages from the vehicle. Note that version on the right is displayed when there are critical messages.

**GPS Status**

Shows you satellite count and current HDOP.

**RC RSSI**

RC signal strength information.

**Telemetry RSSI**

Telemetry signals strength information.

**Battery & Fuel Level in %**

Remaining battery & fuel percent.

**Flight Mode**

Current flight mode. Click to change flight mode.

**RTK GPS Survey-In Status**

Shows you progress of RTK GPS Survey-In process.

## Plan View (Autonomous Missions)

The Plan View is used to plan autonomous missions for your vehicle, and upload them to the vehicle. Once the mission is planned and sent to the vehicle, you switch to the Fly View to fly the mission. More details:

<https://docs.qgroundcontrol.com/master/en/PlanView/PlanView.html>

## Operation Procedure

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- Maintain VLOS of the aircraft at all times
  - Make sure that the GNSS signal is strong. Otherwise, A-B Route operation mode may be unreliable.
- 
- Make sure to inspect operation environments before flying.
- 

Switch the Flight mode to 'Loiter' when a strong GNSS signal is present and the onscreen display of Satellite number is greater than 20 3D or RTK. Fly the aircraft to a safe height.

## 1. Record Point A and B in order

Switch the Flight mode to 'ZigZag'. Fly the aircraft to the starting point. Switch A-B switch right to depict as Point A. The App indicates Point A is recorded.

Fly the aircraft to the turning point. Switch A-B switch left to depict as Point B. The App indicates Point B is recorded and an A-B route is produced in white color.

---



- Make sure to record Point A first, and the Point B, and ensure that the distance between Point A and B is greater than 1 meter.
  - Update Point B by flying the aircraft to a new position record. Note that if Point A is updated, Point B must be too.
  - For optimal performance, it is recommended to keep the direction of Point A and B parallel to one side of the rectangular spray area.
- 

More details about ZigZag mode:

<https://ardupilot.org/copter/docs/zigzag-mode.html?highlight=spray>

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## Operation Resumption

When exiting a Route or an A-B Route operation, the aircraft records the last WayPoint. The Operation Resumption function allows you to pause an operation temporarily to refill the spray tank, fuel or avoid obstacles manually.

### Recording the Last WayPoint

Users can record the location of the last waypoint. If GNSS signal is strong, exit a Route or A-B Route operation through one of the following methods to record the last WayPoint.

1. Fuel is low;
2. Initialize Return to Home RTH;

3. Toggle the Flight Mode Switch;
4. Obstacles detected. The aircraft brakes and enters obstacle avoidance mode or hovers;
6. The aircraft reaches its distance or altitude limit;
7. If the GNSS signal is weak, the aircraft enters Attitude mode and exits the Route or A-B Route operation. The last position where there was a strong GNSS signal is recorded.



- Make sure that the GNSS signal is strong when using the Operation Resumption function. Otherwise, the aircraft cannot record and return to the last Waypoint.
- 

## Resuming Operation

1. Exit a Route or A-B Route operation through one of the above methods. The aircraft records the last WayPoint.
2. Fly the aircraft to a safe location after operating the aircraft or removing the conditions for recording WayPoint.
3. Tap Resume at right side of App screen.
4. Return Mission

When aircraft returns to the Mission, it will start from the last WayPoint.

## Radar

### Profile

In optimal operating environment, the radar module can predict the distance between the aircraft and corps or other surface in forward, rear, and downward directions to fly at a constant distance to ensure even spraying and terrain following capability. The Radar can also detect obstacles 30 meters away from the aircraft. The radar module adopts digital beam forming technology, which supports 3D point cloud imaging that effectively senses the environment and helps to circumvent obstacles in both Route and A-B Route modes. In addition, radar module limits the descent speed of the aircraft according to the distance between the aircraft and ground, to provide a smooth landing. In Manual operations, the radar module can also measure the spraying distance above corps, but the aircraft is not able to fly at a constant spraying distance. The obstacle avoidance function can be used in any mode.

## Detection Range

The detection range of the radar module is -50 to +50 degree in horizontal and 0 to 10 degree in vertical. Note that the aircraft cannot sense obstacles that are not within the detection range. Fly with caution.



The effective horizontal detection range varies depending on the size and material of the obstacle. The effective horizontal detection range is approximately -38 to +38 degree.

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## Obstacle Avoidance (optional) Function Usage

Front and rear Obstacle avoidance are optional. Please require from us if needed. They are used in the following two scenarios:

1. The aircraft begins to decelerate when it detects an obstacle 15 meters away and hovers in place when 6 meters away from the obstacle. Users can not accelerate in the direction of the obstacle, but can fly in a direction away from the obstacle.
2. The aircraft immediately brakes and hovers if it detects an obstacle nearby. Users cannot control the aircraft when it is braking.

When the aircraft is hovering, it is in Obstacle Avoidance mode. Users can fly in a direction away from the obstacle to exit Obstacle Avoidance mode and regain full control of the aircraft.



Obstacle avoidance during RTH is different from above descriptions. Refer to Obstacle Avoidance During RTH for more information.

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## Altitude Stabilization Function Usage

1. Make sure that you have enabled the altitude stabilization function of the radar module in App Agricultural settings.
2. Enter the desired operation mode, and configure the desired spray distance above corps.
3. If the operating environment is ideal, the aircraft flies above the corps at the preset height. Push the Throttle Stick (left stick for Mode 2) to adjust the height any time under

any flight mode.



- In manual operation mode, users have complete control of the aircraft. Pay attention to the flying speed and direction when operating. Be aware of the surrounding environment and avoid the blind spots of the radar module.
- Obstacle Avoidance is adversely affected when aircraft pitch exceeds  $15^\circ$ . Fly with caution. Obstacle Avoidance is disabled when distance between aircraft and corps is less than 0.8 meter.
- Do not set flight speed over 5 m/s when distance between aircraft and corps is greater than 2 meters. The maximum flight speed is 7 m/s. Operate with extra caution when flying over inclined surfaces. Recommended maximum inclination of different aircraft speeds:  $10^\circ$  at 1 m/s,  $6^\circ$  at 3 m/s, and  $3^\circ$  at 5m/s.
- Maintain full control of the aircraft at all times. DO NOT rely solely on App. Keep the aircraft within VLOS at all times. Use your sound discretion to operate the aircraft manually to avoid obstacles.
- Comply with local radio transmission laws and regulations.
- The radar module can only function properly in flat landscapes. It cannot function is sloping landscapes with inclination more than  $10^\circ$  or in landscapes with sudden changes in elevation.
- The sensitivity of the radar module may be reduced when operating several aircraft within a short distance. Operate with caution.
- Before use, make sure that the radar module is clean and the outer protective cover is not cracked, chipped, sunken or misshapen.
- Do NOT attempt to disassemble any part of the radar module that has already been mounted prior to shipping.
- The radar module is a precision instrument. DO NOT squeeze, tap, or hit the radar module.



- If the radar module frequently detects obstacles incorrectly, first check to make sure the mounting bracket and the aircraft landing gear are properly secured. Second, perform the IMU calibration. If the radar module still does not work,
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contact Richen power Support or your dealer.

- Keep the protective cover of the radar module clean. Clean the surface with a soft damp cloth and air dry before using again.
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## Empty Tank

### Profile

Please keep notice the chemical tank. The aircraft resumes the operation when the spray tank is empty.

## Operation Environment

### Operation Environment

1. DO NOT use the aircraft to spray in winds exceeding 8 m/s, heavy rain (precipitation rate exceeding 25 mm (0.98 in) in 12 hours), snow, or fog.
2. Only fly in open areas. Tall buildings and steel structures may affect the accuracy of the compass and the GNSS signal.
3. Pay attention to utility poles, power lines, and other obstacles. DO NOT fly near or above water, people, or animals.
4. Avoid flying in areas with high level of electromagnetism, including mobile phone base stations and radio transmission towers.
5. The recommended maximum operation altitude is 2 km (6,560 ft) above sea level. However, the load must be reduced. The maximum load is 10 liters at 2 km (6,560 ft), 15 liters at 1.5 km (4,920 ft). Reduce the load when voltage is continuously lower than 46 V.
6. Make sure that there is a strong GNSS signal and the RTK antennas are unobstructed during operation.
7. DO NOT operate the aircraft in doors.

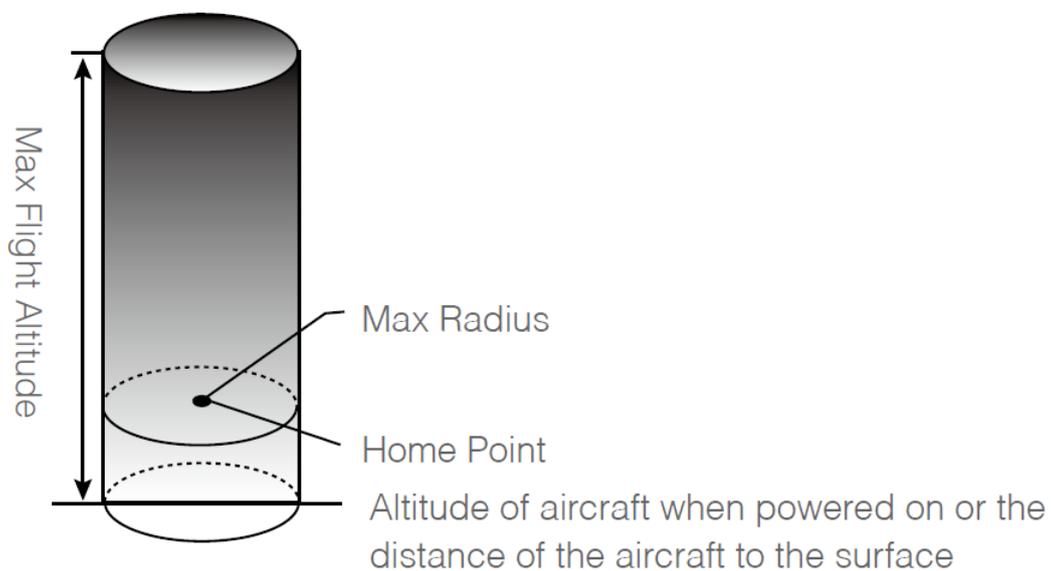
## Flight Limits and GEO Zones

Unmanned aerial vehicle (UAV) operators should abide by the regulations from self-regulatory organizations such as the International Civil Aviation Organization, the Federal Aviation Administration, and their local aviation authorities. For safety reasons, flight limits are enabled by default to help users operate this aircraft safely and legally. Users can set flight limits on height and distance.

When operating with a strong GNSS signal, the height and distance limits and GEO Zones work together to monitor flight. With a weak GNSS signal, only the height limit prevents the aircraft from going above 20 meters.

### Maximum Height and Radius Limits

Users can change the maximum height and radius limits in App. Once completed, the aircraft flight is restricted to a cylindrical area that is determined by these settings. The tables below show the details of these limits.



With a strong GNSS signal	
Flight Limits	
<b>Max Height</b>	<b>Flight altitude must be below the preset height</b>
<b>Max Radius</b>	<b>Flight distance must be within the max radius</b>

With a weak GNSS signal

Flight Limits

**Max Height**      **Flight altitude must be below the preset height**

**Max Radius**      **No limit.**



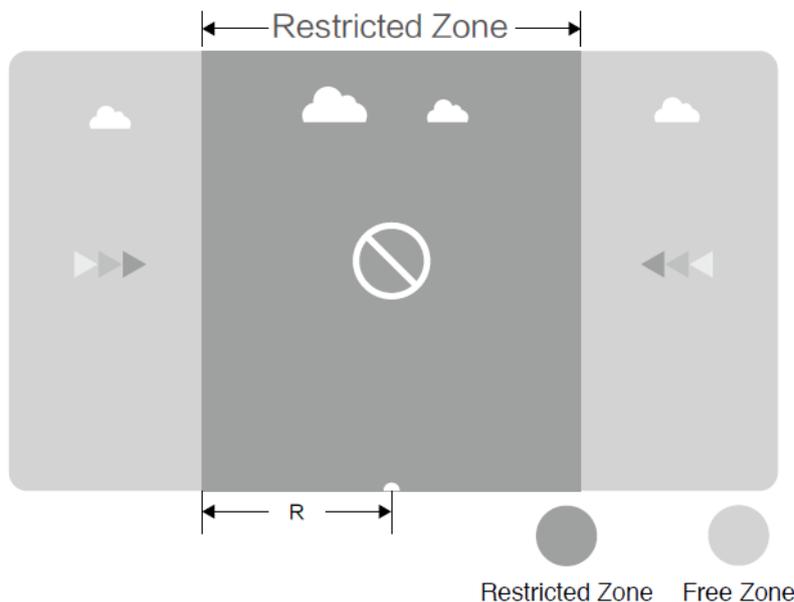
- If the aircraft flies into a Restricted Zone, it can still be controlled, but the aircraft can only fly in a backward direction.
- If the aircraft loses GNSS signal and flies out of the max radius but regains GNSS signal later, it will fly back within range automatically.

## GEO Zones

GEO Zones are divided into different categories. All GEO Zones are listed on website at (<http://www.dji.com/flysafe/no-fly>)

GEO Zones are explained below (GNSS required):

Depending on the local regulation, a certain radius around a marker forms as Restricted Zone, inside of which takeoff and flight are prohibited.



With a weak GNSS signal		
Area	Restriction	Aircraft Status Indicators
Restricted Zone 	Motors will not start If the aircraft loses GNSS signal and enters a Restricted Zone but regains GNSS signal later, the aircraft will enter semi-automatic descent and land.	Red flashing
No Flight Restrictions	Users can fly their aircraft freely	None

Semi-automatic descent: All stick commands except the throttle stick command are available during descent and landing. Motors automatically stop after landing.



- When operating in Restricted Zones, the aircraft status indicators blink red slowly and continue for five seconds, and then the switch to the current aircraft status for twelve seconds. If the aircraft is still in the restricted zone at that point, it switches to blinking red slowly for five seconds again and so on.
- DO NOT fly near airport, highways, railway stations. Railway lines, city centers, or other busy areas. Make sure the aircraft is visible at all times.

## Calibration

### Calibrating the IMU Horizontal Level Horizon

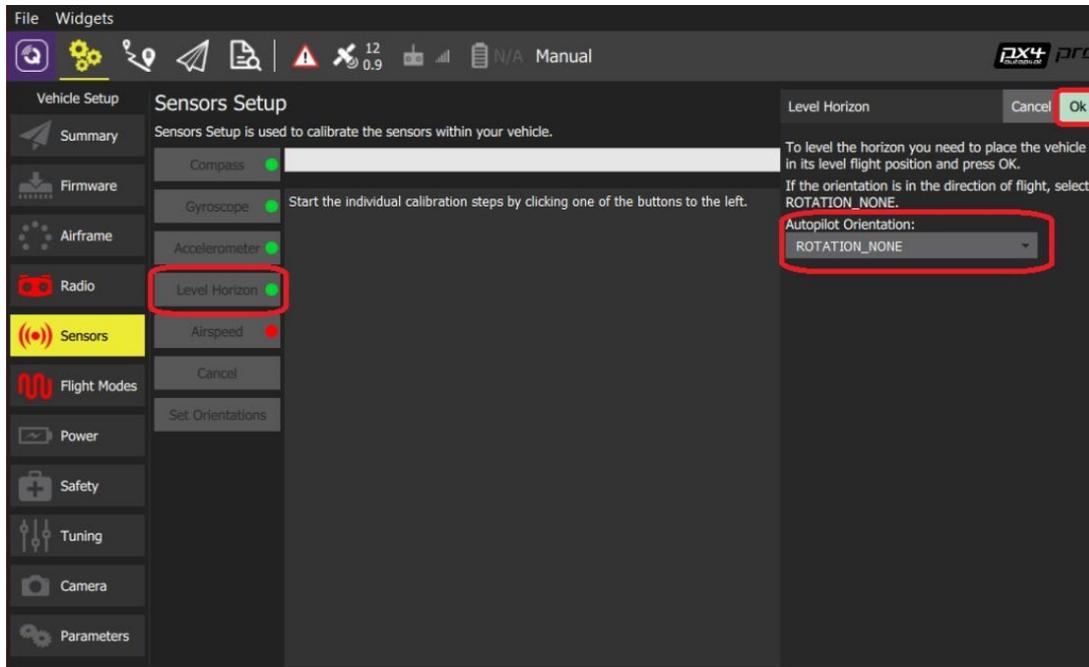
#### Level Horizon

'Horizontal Calibration' is required before first flight or after long distance transportation further than 600 kilometers (373 miles).

Place the aircraft horizontally on the ground, switch power ON. Connect to the ground station APP, and tap the blue 'CALIBRATION' button for 'horizontal calibration' to correct the plane's IMU horizontal error.

If the horizon (as shown in the HUD) is not level you can calibrate the level horizon for your vehicle. You will be asked to place the vehicle in a level orientation while it captures the information.

Click the Level Horizon sensor button. Level Horizon calibration



Note: If the plane is placed on a sloped ground, the aircraft's flight posture will also be tilted after calibration. Please recalibrate on a horizontal ground.

## Calibrating the Compass (no need to do)

The compass is not used in Y20. It is not required to calibrate the Compass. The drone can work near strong magnetic fields.

# Appendix

## Specifications

Total Weight (Excluding fuel) (kg)	38
Max Takeoff Weight (kg)	58(sea level)
Max Hovering Time (minutes)	30
GNSS+D-RTK Dual Positioning System Hovering Accuracy (cm) GNSS* GPS+GLONASS+BEIDOU	D-RTK Enabled: horizontal & vertical±10 (when Beidou available) D-RTK Disabled: Horizontal±60 vertical±30 radar modular enabled±10
Dimensions (L x W x H) (mm)	805 x 850 x 850 (Frame arms folded)
Diagonal Wheelbase (mm)	1800
Number of Arms	4
Max Operating Speed (m/s)	7
Max Flying Speed (m/s)	10
Fuel Consumption (liter/ hour)	7
Operating Temperature ( ° C)	-20 ~ 40
Max Service Ceiling Above Sea Level (m)	2000
Press to Start	yes
Gasoline	Regular92 or E92 or above
FPV Camera	FOV Horizontal 98° Vertical78° Resolution1080x960
Liquid Tank Volume (liter)	Standard 16; Max 20
Liquid Tank Payload (kg)	Standard 16; Max 20
Number of Nozzle	4

Nozzle Model	Atomized Spraying System - Sprinkler, Droplet Size 50-300 $\mu$ m
Max Spray Flow (liter/min)	15
Spray Width (m)	6~10 m ( 4 nozzles, at a height of 1.5~3 m above crops)
Terrain Follow Radar	Altitude detection range 1 - 30 m; Stabilization working range 1.5 - 15 m; Max slope in Mountain mode 35°

\* Hovering time acquired at sea level win speeds lower than 3 m/s

## Hybrid System LED Indicator Description

Blinking Patterns	Description
Solid green	In order, press to start the engine
Red flashing	Overload, low voltage, coolant too hot, or generator failure, land to inspect
Red-green flashing	Time to service, contact your dealer

## List of Hazards and solutions

#	Hazards	Consequence	Severity	Solutions
1	Modification, disassemble by users	Short-circuit chip burned and other damage, circuit false connection	Middle	Implemented by vendors
2	Long time placed in low temperature, strong acid, alkali or other harsh environment	Battery failure	Low	Remove the battery and store in doors
3	Fly in harsh environments,	Crash	High	Flying and operating follow

	such as strong winds, heavy rain, dust, etc.			user manual
4	Take off above the safe take-off weight	Crash	High	Flying and operating follow user manual (82 kgs)
5	Forced flight in the event of aging or damage to components	Crash	High	Flying and operating follow user manual maintenance
6	Change or tear off label	Out of warranty	Low	DO NOT change or tear off label
7	Fuel run out during flight	Engine damage	Middle	Monitor fuel level on App
8	Air intake filter dirty without clean/replacement	Engine power reduced and low voltage	Middle	Flying and operating follow user manual maintenance
9	Spark plug without replacement in time	Engine power reduced and low voltage	Middle	Follow user manual maintenance
10	Carburetor clogged	Engine power reduced and low voltage	Middle	Follow user manual maintenance clean or replace fuel filter
11	Spray system nozzle without cleaning	Spraying malfunction	Low	Follow user manual maintenance
12	Pesticides residue on drone frame	Wires and motor corrosion	Middle	Follow user manual maintenance

## Contact us

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