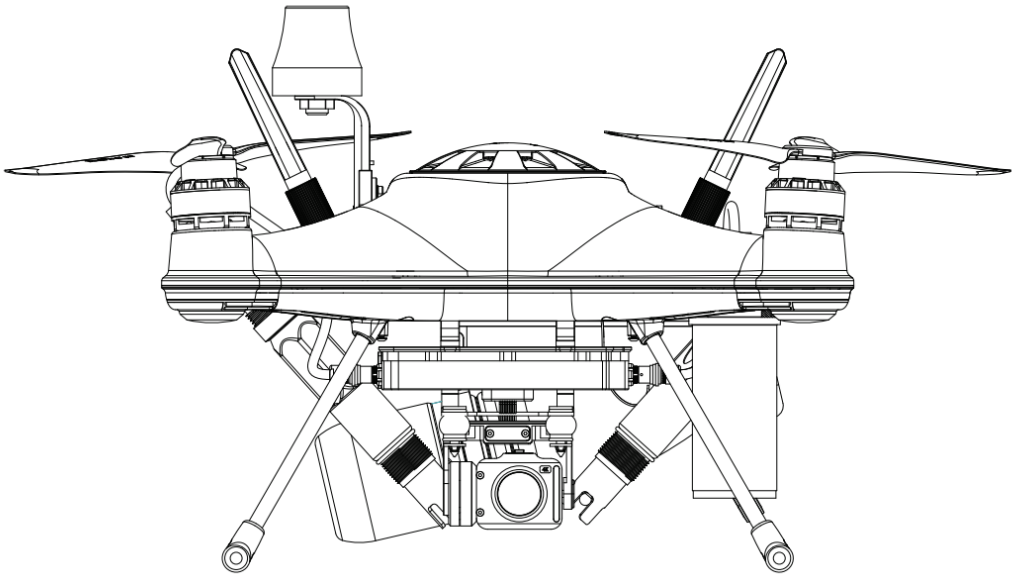
SplashDrone 4 WQMS

Water Quality Monitor System

User Manual



Visit support.swellpro.com for the latest version of this manual and firmware updates for your aircraft and accessories.

V1.0 –2022.10

Thank You

Thank you for purchasing the SwellPro Water Quality Monitor System. We have designed and manufactured the SwellPro Water Quality Monitor System to the highest quality standards.
Like any marine equipment, long-life and trouble-free operation rely on proper care and maintenance. With proper care and maintenance, you should enjoy your aircraft for many years.
It is essential to familiarize yourself with the features of this unique aircraft by carefully studying this manual and particularly the priority sections indicated in the Table of Contents.
Visit www.swellpro.com for the latest manuals, software, and tips. Refer to the Version Information section at the end of this manual, which details additions and corrections to this manual.

Using this Manual

This document is designed to be printed or viewed on a computer or mobile device. If used electronically, you can search directly for terms like “Charging” to find references. Additionally, you can click on any topic in the Table of Contents to navigate directly to that topic.

FAQ

The user manual is the best companion while using the product. For the specific problem using the product, the FAQ can be another great resource for you to look at. Go to the SwellPro website, look for support >product support > the product > FAQ to find the FAQ page. support.swellpro.com

Video Tutorials

Visit and subscribe to the SwellPro YouTube channel for tutorial videos and product information.

Social Media

Join our SwellPro Facebook page to meet other people who share their adventures with SwellPro. www.facebook.com/SwellPro/

Register Product Warranty

Please register your product as soon as possible to ensure warranty coverage.

Download Dronar App

Get the most from your SplashDrone 4 by flying with the SDFly 2 App. It’s available on both the App Store and Google Play store. You can also download the App on our support website: support.swellpro.com.

There are 2 SDFly Apps, SDFly App and SDFly 2 App. Please use the SDFly 2 App.

Contents

⚠ Warning

⚠ If you want to operate the aircraft on a ship or other mobile platform, please do calibration on land first, as it will not work properly on a mobile platform.

Please read all safety information before using this product.

- Make full preparations before each flight.
- Flying in a NO-FLY ZONE that is regulated by local laws & rules is prohibited.
- Any illegal act like violating the privacy or property of others that is regulated by local laws & rules is prohibited.
- Flying in a crowd is prohibited.
- Damage or injuries may incurred when the user/s are under the influence of alcohol, drugs, or medication.

Flight Environment Requirement

- Always choose the open space as an ideal flying environment.
- Flying between or near tall buildings could adversely affect the functioning of the compass and adversely affect or block GPS and transmission signals.
- During the flight, try to maintain the line of sight with the aircraft, keep away from obstacles and people.
- Avoid flying near areas with high electromagnetic interference such as power lines or signal towers to minimize the risk of interfering with the remote controller of the aircraft.
- Fly below 4000 meters above sea level as environmental factors including air density and wind shear reduce the performance of the aircraft and battery.
- Before flying in low temperatures, warm the battery to ~25℃ to maximize flight time.
- Although the Splash aircraft 4 is waterproof, do not fly in fog or strong wind conditions. (For wind speed exceeding 14 m/s, or above Beaufort Force 6)

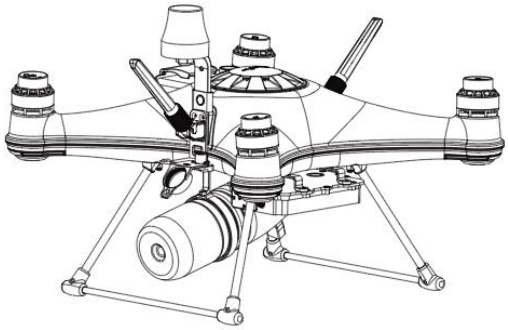
Flight Restrictions

According to provisions of the International Civil Aviation Organization and many national air traffic regulations, drones must be operated in specified airspaces. By default, the SplashDrone 4 is configured to not exceed an altitude of 120m the Home Point altitude.

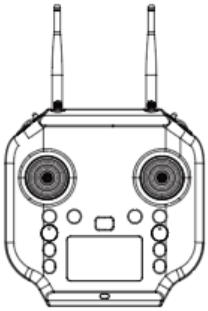
💡 **If you need to cancel the height limitation, please set the flight altitude to 0 on the SDFly 2 App.**

Product Overview

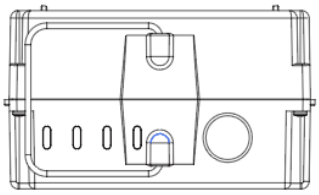
Package Content



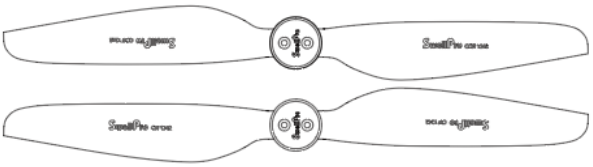
SplashDrone 4 Water Quality Monitor System *1



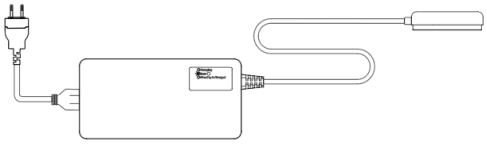
Remote Controller*1



Intelligent Battery *3

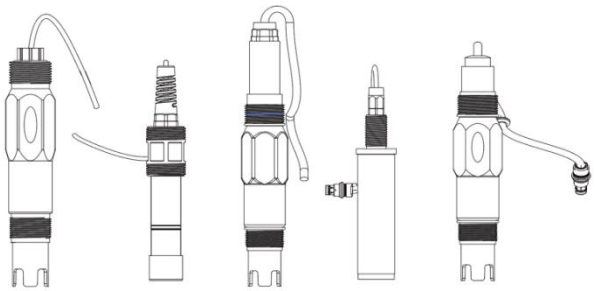


Propellers *2sets

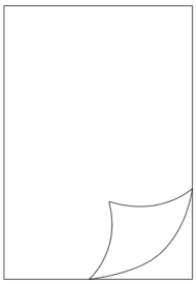


Charger *1

RC Charging Cable *1

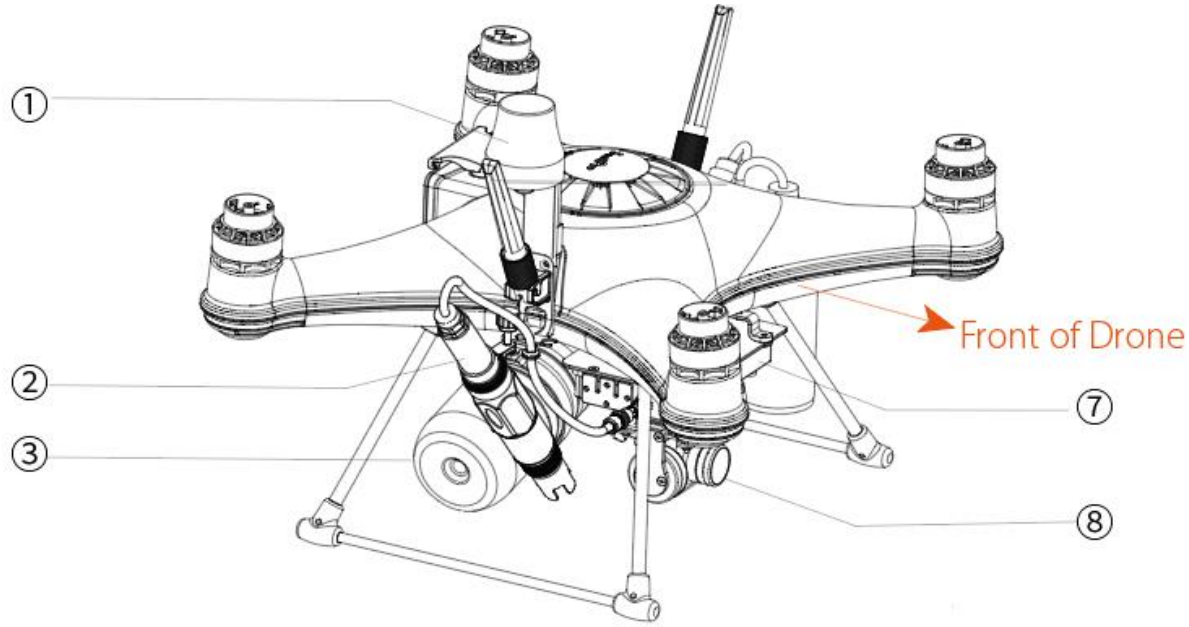


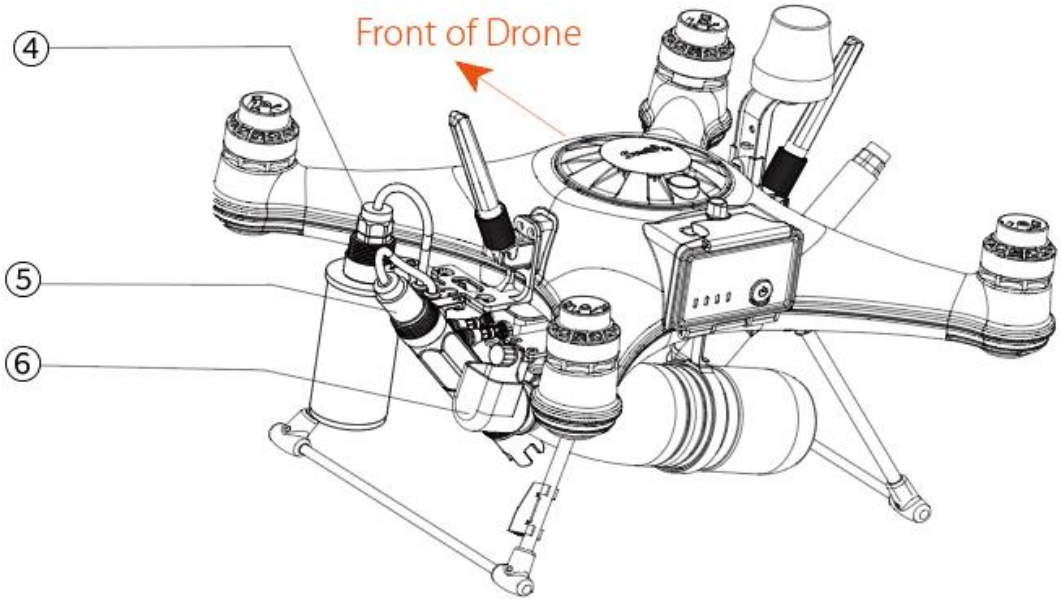
Five sensors for pH, dissolved oxygen, ammonia nitrogen, turbidity and conductivity



User manual *2

Aircraft Diagram

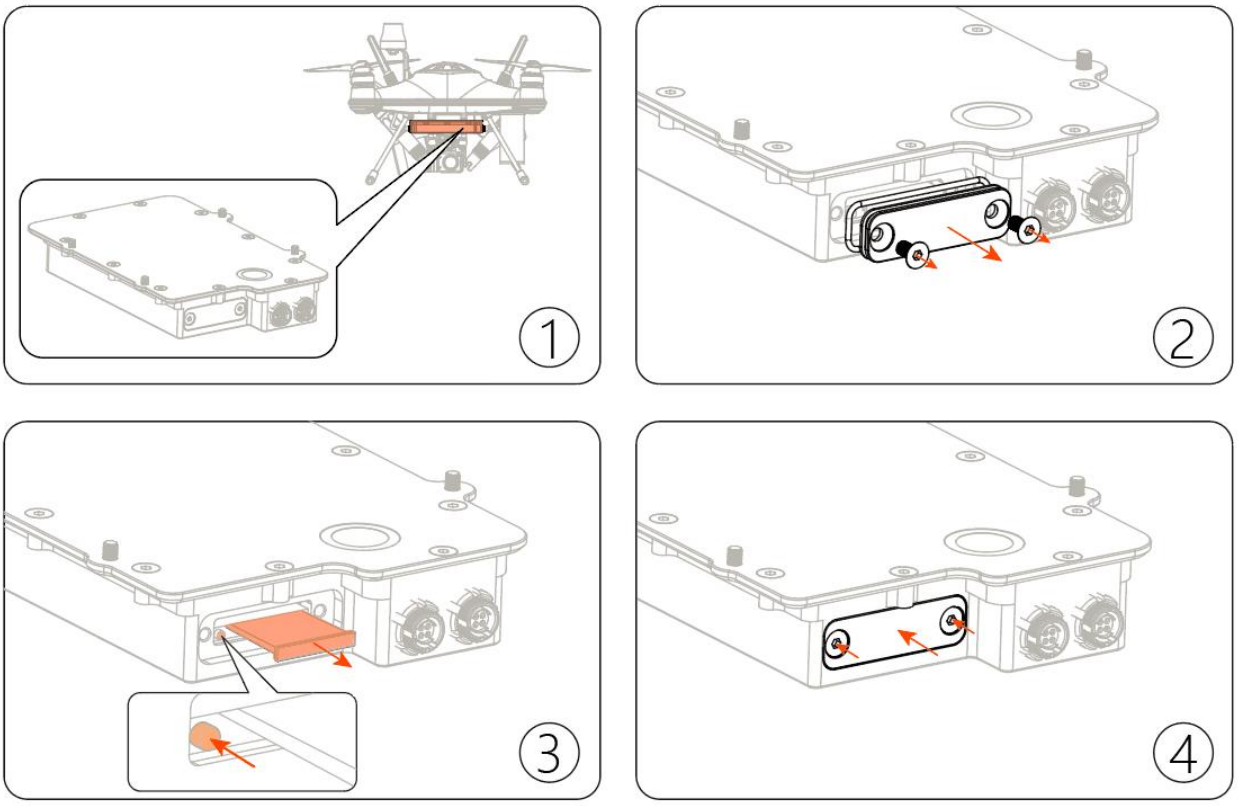




1. GPS Module
2. Ammonia Nitrogen Sensor (replaceable)
3. Water Bottle (replaceable)
4. Turbidity Sensor (replaceable)
5. pH Sensor (replaceable)
6. Water Collector Module
7. Core Components of Water Quality Monitor System
8. Gimbal Camera

Installation

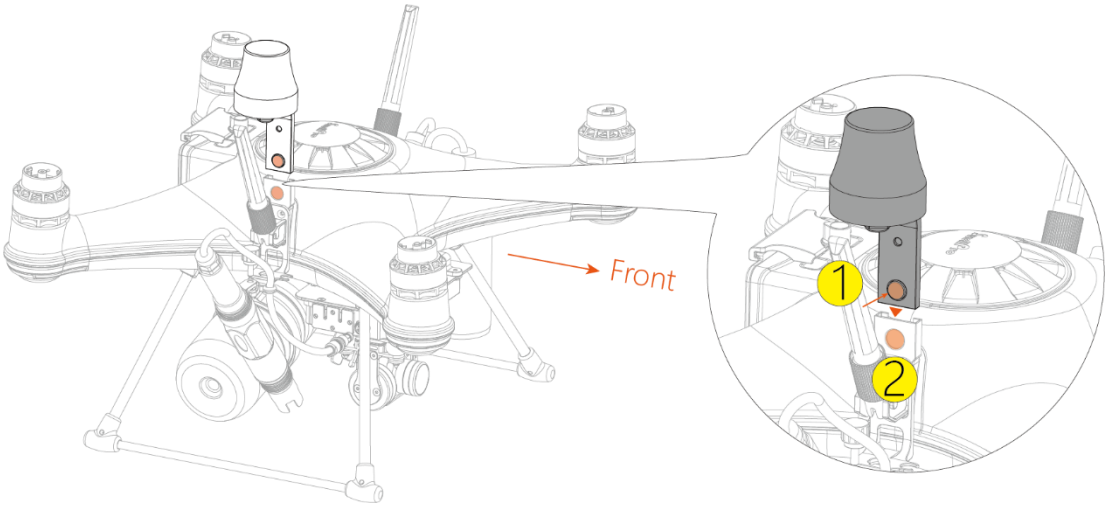
1. SIM Card



Notice:

- After inserting the SIM card, check the mobile connection status (please refer to section **Cloud System** for detail information, *Instruction > Cloud System*). If there is no signal connection, please contact SwellPro Support. support.swellpro.com
- Please insert/remove the SIM card before installing sensors.

2. GPS Module

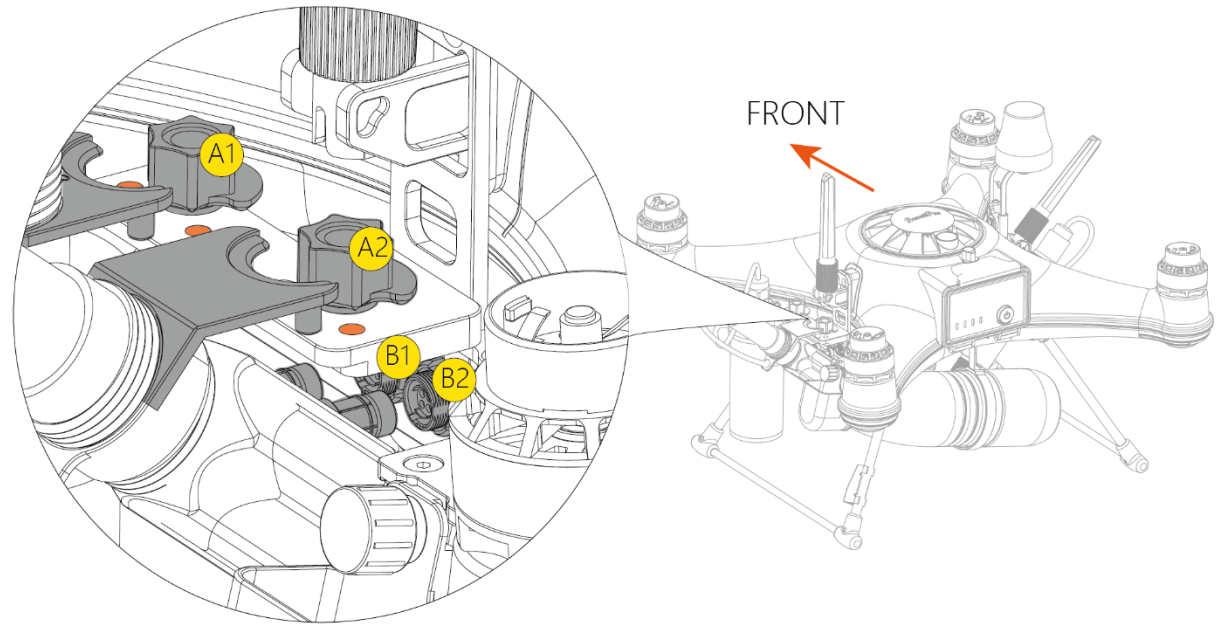


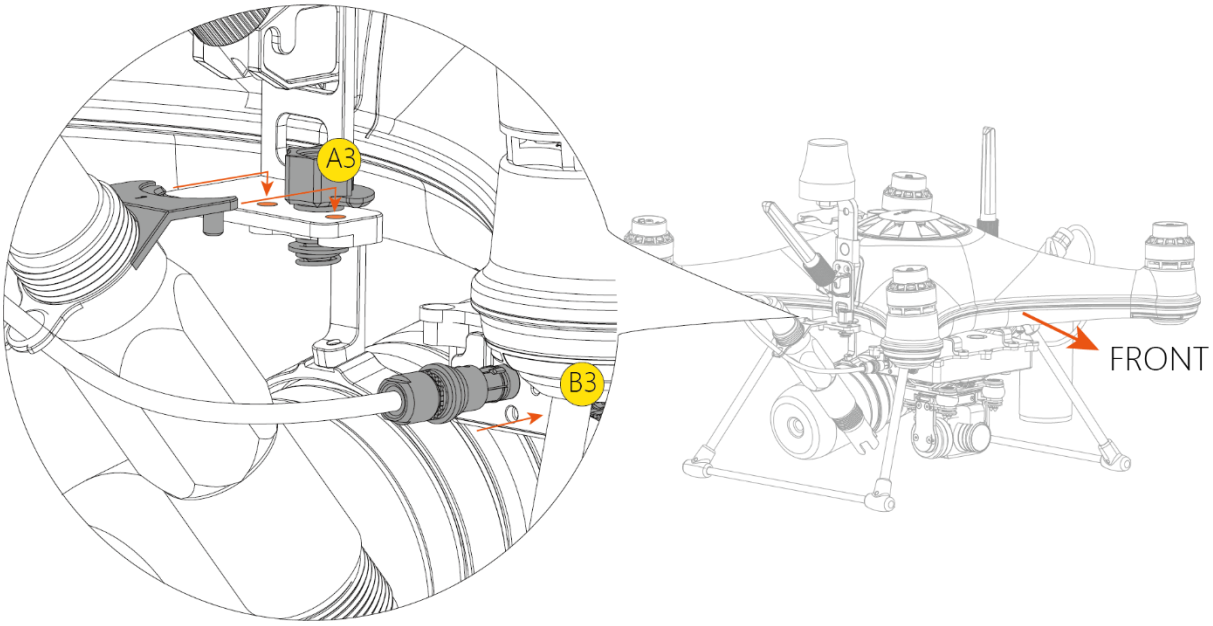
Press the button ① and snap it down into the button holder ②.

Notice:

- Do not pull the cable.

3. Sensor





A1/A2/A3 - Fixing Knob

B1/B2/B3 – Waterproof Port

Fixing Knob

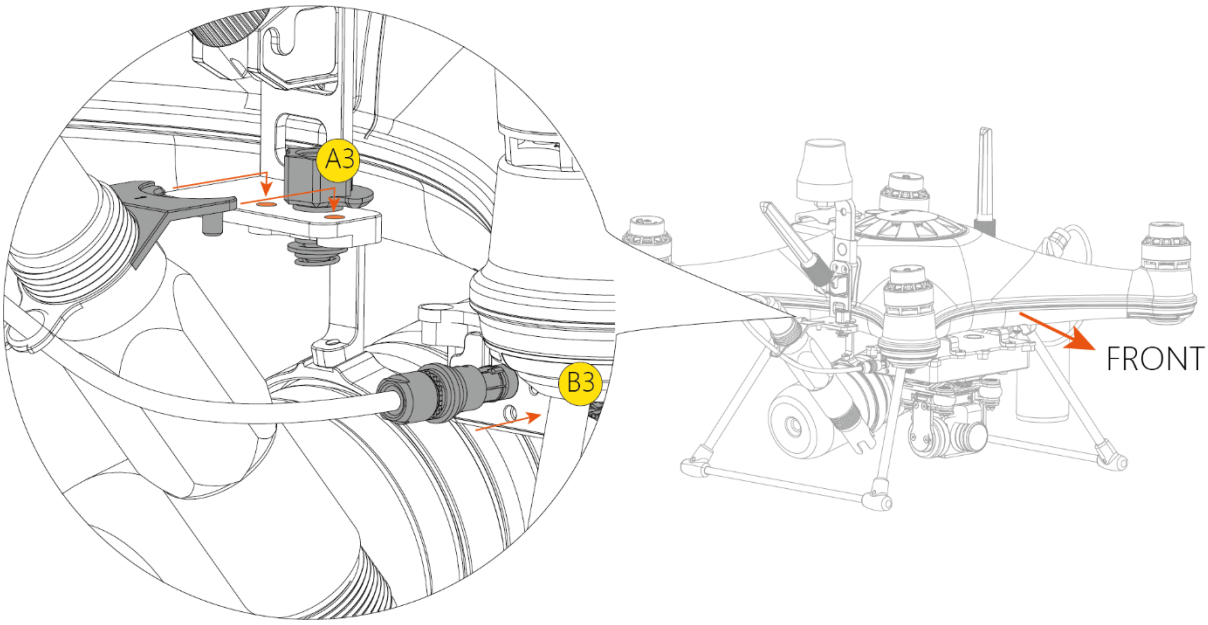
- A1 can be installed turbidity sensors

- A2 can be installed ammonia nitrogen, dissolved oxygen and conductivity sensors (NOT turbidity sensors).
- A3 can be installed ammonia nitrogen, dissolved oxygen and conductivity sensors (NOT turbidity sensors).

Waterproof Port

- Install A1 sensor cable into B1 waterproof port.
- Install A2 sensor cable into B2 waterproof port.
- Install A3 sensor cable into B3 waterproof port.

Take the sensor installation at the A3 as an example:



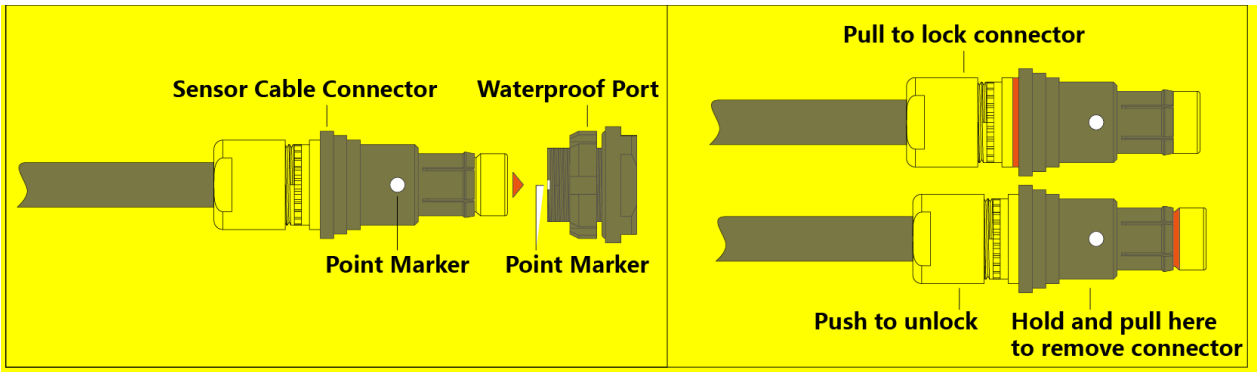
Install Sensor

1. Insert sensor cable into the port (The point makers need to be aligned)
2. Insert the positioning hole of sensor into the hole of A3, and then tighten the knob, installation is finished.

(A1/2 is installed in the same way as A3)

⚠ pH, ammonia nitrogen, dissolved oxygen, conductivity, turbidity sensors are installed in the same way. Choose the senor according to your need, and an aircraft can only install 3 sensors and a water Collector at the same time.

Waterproof Connector



- To install: Align point markers then insert the connector into the port. Pull the cable to lock the connector.
- To remove: Push the cable to unlock. Then hold and pull the area showing above to remove the connector.

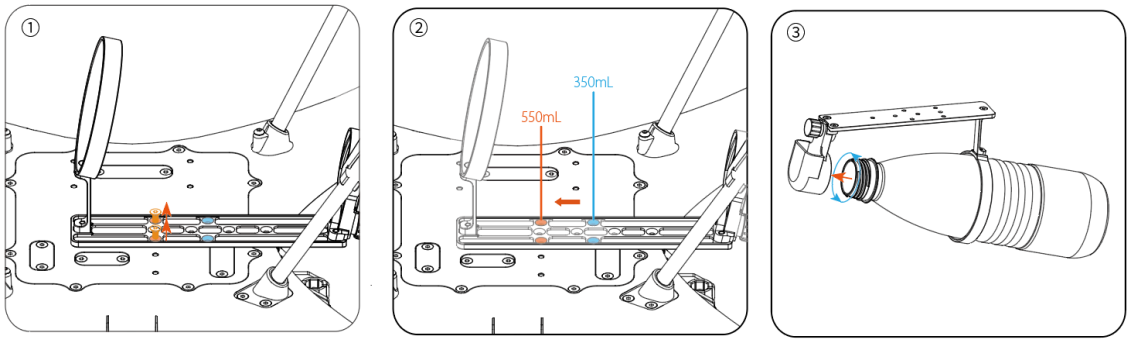
4. Water Collector

Water collector is installed at the 550ml mark before leaving the factory. If you need to adjust or remove it, please refer to the following steps:

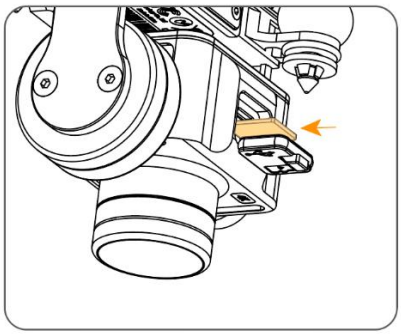
①Remove the screw;

②Move the 2 hole of water collector up to the screw hole of aircraft, and then lock it with screws;

③ Install the 350ml water bottle, the installation is done.



5. SD Card



1. Open the soft rubber seal on the top of the camera, insert the Mirco SD card in the correct direction, press the Mirco SD card, the "click" sound indicates that the installation is in place.

2. After installing the Mirco SD card, plug the rubber seal back.

⚠ Make sure the rubber seal is tightly plugged in to ensure waterproofing.

- **The camera supports Mirco SD cards with a maximum capacity of 128GB. Since the camera requires fast reading and writing of high-stream video data, please use Mirco SD cards with Class 10 or UHS-1 or above to ensure proper functioning. •**
- **Do not insert or unplug the Mirco SD card during shooting, as data files may be damaged or lost.**
- **Once you are done recording, stop recording and save the file. If you turn off the power directly before saving the files, the recording file might be damage.**

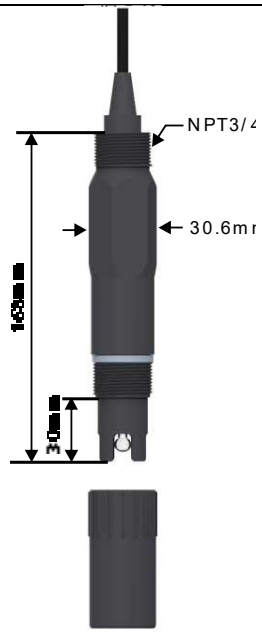
Sensor

pH Sensor

Use: Measure real-time pH and temperature values of liquids.

1. Parameter

Measuring range	0...14 pH
Accuracy	0.02 pH
Resolution	0.01 pH
Temperature measurement range	0.0...60℃
Electrode slope	≥96%
zero potential	7.00±0.25
Shell material	PPS, ABS
Thread	
Liquid junction	PTFE
Connecting thread	NPT3/4,M39*1.5
Withstand voltage range	0...4bar

Sheet Resistance	< 500MΩ	
NO.	H08121615260	
Degree of protection	Ip68	
output	4...20mA and RS485	

2. Sensor Calibration

- The sensor has been calibrated before leaving the factory, and the user can use it directly.
- Recommend calibrate the sensor once every month.
- **Calibration method：Please refer to Multisensor Monitor User Manual**.

3. Maintenance and Store

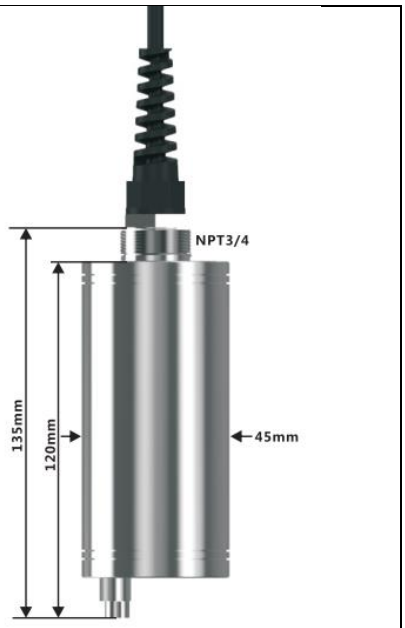
- After rinsing the electrodes, only wipe the sensor with a soft cloth, do not rub the sensitive film.
- When storing the electrode, the protective cover containing 3M KCl (3 mmol/l potassium chloride solution) solution must be connected to ensure that the electrode bulb is protected.
- The white KCl crystal on the electrode will not affect use, just remove the crystals with distilled water and then blot dry.
- Cable connector must be kept clean and dry.
- It is forbidden to dry the sensor for too long, and the dry electrode should be activated in 3M KCl (3 mmol/l potassium chloride solution) solution before it can be used.

Turbidity Sensor

1. Use: Measure real-time turbidity values of liquids.

2. Parameter

Measuring range	0...4000NTU， 0...4000mg/L	

Temperature measurement range	0...80.0°C	
Shell material	Stainless steel	
Precision	+1.0% FS	
Voltage	DC12V .	
Degree of protection	Ip68	
Withstand voltage range	0.. .4bar	
Output	4...20mA/ maximum load 7500RS485/MODBUS-RTU	

3. Sensor Calibration

- The sensor has been calibrated before leaving the factory, and the user can use it directly.
- Recommend calibrate the sensor once every month.
- **Calibration method：Please refer to Multisensor Monitor User Manual**.

4. Maintenance and Store

- Sensor need to be activated and calibrated before use after cleaning or long-term storage.
- Cable connector must be kept clean and dry.
- When the electrode needs to be stored for a long time, remove the sensor from the aircraft, disconnect the sensor, put on the protective cover after drying, and store it in a dry place at room temperature.
- Please calibrate the sensor once every month.

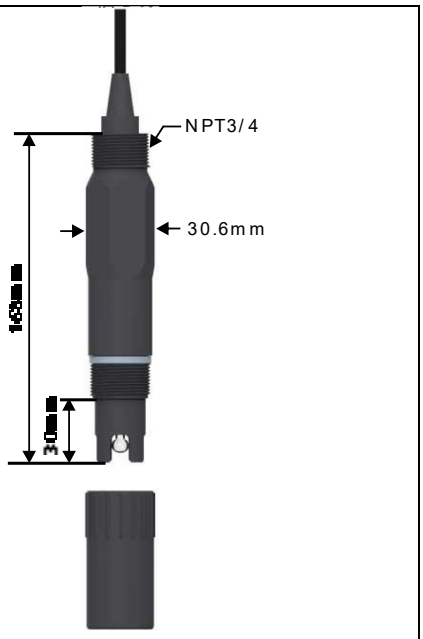
Ammonia Nitrogen Sensor

Use: Detect real-time ammonia nitrogen value of liquids to understand and control ammonia nitrogen emissions to prevent water eutrophication.

1. Parameter

Measuring range	0.1...18000ppm	
Temperature measurement range	0.0...60℃	
Electrode slope	56±4mV（25℃）	

Shell material	PC,PBT
Liquid junction	Ceramic Sand Core
Connecting thread	NPT3/4,M39*1.5
Withstand voltage range	0...3bar
Membrane resistance	1...4MΩ
NO	H08121615260
Degree of protection	Ip68
Output	4...20mA and RS485



2. Sensor Activation

- The electrode should be activated in deionized water for more than 6 hours before use.
- Sensor stored in a dry environment need to be activated before use.

Tips: use the Multisensor Monitor to activate the sensor the day before your operation. Connect the sensor to the Multisensor Monitor. Cover the tip of the sensor with pure water and leave it until the next day, then calibrate it before you use it.

5. Sensor Calibration

- The sensor has been calibrated before leaving the factory, and the user can use it directly.
- Recommend calibrate the sensor once every month.
- **Calibration method：Please refer to Multisensor Monitor User Manual**.

3. Maintenance and Storage

- After rinsing the electrodes, only wipe the sensor with a soft cloth, do not rub the sensitive film.
- Store the sensor dry. Do not cover the sensor with water for storage.
- Cable connector must be kept clean and dry.
- Sensor need to be activated and calibrated before use after cleaning or long-term storage.

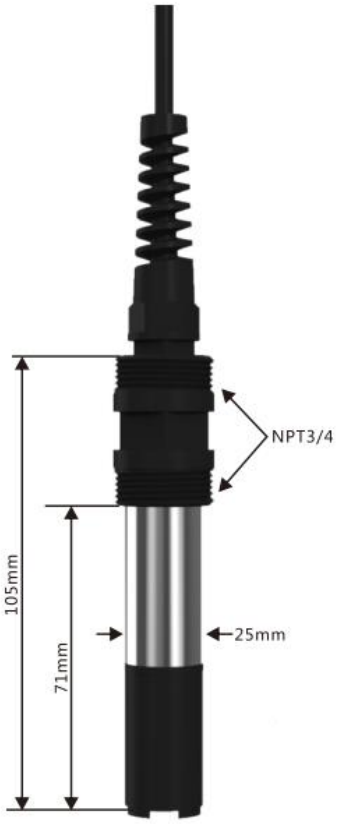
Dissolved Oxygen Sensor

Use: Detect the amount of dissolved oxygen in water. This measurement has important implications in the following ways:

- Sewage treatment: Measurement and regulation of oxygen in active sludge ponds for efficient biodegradation.
- Hydrological monitoring： measures oxygen levels in rivers, lakes, oceans, indicating water quality.
- Water treatment： Oxygen measurement can monitor the status of drinking water.
- Fish pond： Oxygen levels are measured and regulated to maintain optimal ecological and growth conditions

1. Parameter

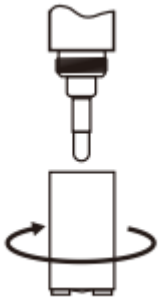
Measuring range	0.0...20.00mg/L
Temperature measurement range	0.0...60.0°C
Sensitivity	+0.05%
Media velocity	15...30L/h
Shell material	PC+ Stainless steel
Accuracy	2%
Calibration method	Zero oxygen calibration、Full scale calibration
Degree of protection	Ip68
Withstand voltage range	0...4bar
Output	4...20mA and RS485



2. Add electrolyte and replace head

- The new electrode has its own electrolyte; it is recommended to confirm it before use.
- Replace electrolyte every 30 days.

- If the electrode signal is abnormal, the head needs to be replaced, The chlorine membrane is replaced every 6-12 months, and the steel oxide membrane is replaced every 18-24 months
- The operation steps of replacing the head and adding the electrolyte are shown in the figure.

		
Disconnect the power supply, turn counterclockwise and remove the head smoothly, and that pour residual electrolyte into waste pool.	Tilt the head and squeeze electrolyte bottle gently, so that electrolyte slowly flows into the head until the electrolyte is full.	Turn the head clockwise until the liquid flows out, and repeat tightening and loosening 3 times to completely discharge the air.

3. Electrode polarization

Polarization method: Connect electrode to transmitter, put the electrode into in clean water, and start polarization after connecting to power supply.

Electrodes need to be polarized in the following cases:

- When the electrode is used for the first time, polarize for more than 6 hours
- After replacing head or electrolyte, polarize for more than 6

	Power time t1(Min)	Polarization time t2(Min)
1	t1≤5	2*t1
2	5<t1≤15	4*t1
3	15<t1≤30	6*t1
4	t1> 30	360

4. Electrode Calibrated

- The electrode has been calibrated before leaving the factory, and the user can use it directly.
- Electrode calibration every 1~2 months.
- **Calibration method： Please refer to the water quality sensor data display instrument user guide**.

5. Maintenance and Storage

- After rinsing the electrodes, only wipe dry with a soft cloth, do not rub the sensitive film。

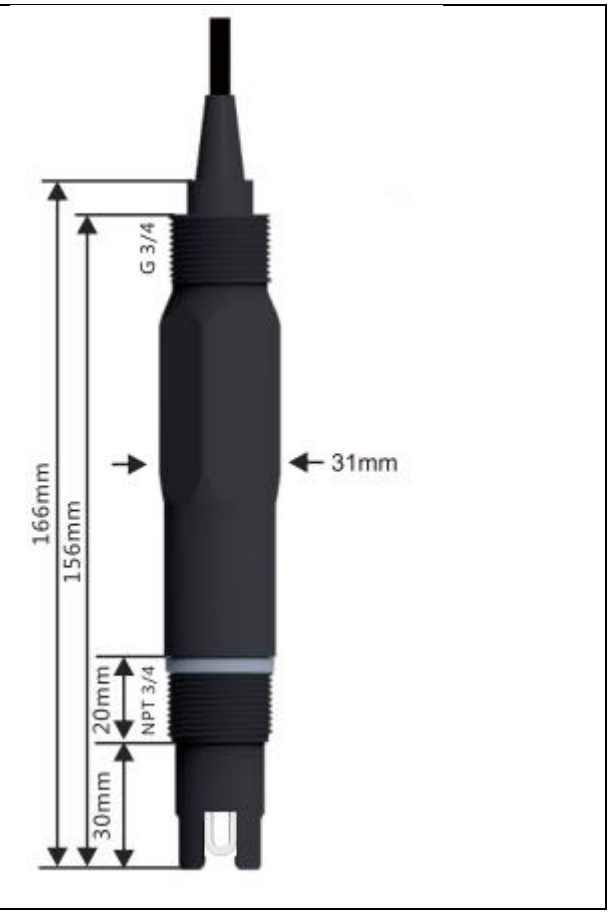
- When storing the electrode, a protective cover containing Supplied make-up fluid must be connected to ensure that the electrode bulb is moistened.
- The white kcl crystal on the electrode will not affect use, just remove the crystals with clean water and then blot dry.
- Cable joints must be kept clean and dry.
- It is forbidden to dry the electrode for a long time, and the dry electrode should be activated in clean water before it can be used.
- No medium attached to the surface during storage.

Conductivity Senor （Suitable for seawater measurement)

Purpose: Measure the conductivity of various solutions such as ultrapure water, pure water, drinking water, sewage, etc. or the concentration of ions in the whole water sample.

1. Parameter

Measuring range	0...20000μS/cm
Temperature measurement range	0.0...60.0°C
Sensitivity	+2%FS
Sensor resolution	1μS/cm
Shell material	ABS, PPS
Compensation mode	Manual compensation/ automatic compensation
Signal output	4...20mA, RS485
Withstand voltage range	0... 4bar
Output load	＜750Ω
Degree of protection	Ip68
Current accuracy	1%FS



2. Electrode Calibrated

- The electrode has been calibrated before leaving the factory, and the user can use it directly.
- Electrode calibration every 30 days.
- **Calibration method：Please refer to the water quality sensor data display instrument user guide**.

3. Maintenance and Storage

- Conductivity sensors need to be stored in a dry environment
- If the sensor is dirty, it will lead to inaccurate measurement. It should be cleaned and calibrated in time.
- Cable joints must be kept clean and dry.

Instructions

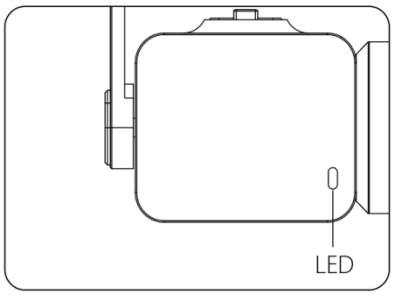
Single axis camera can take 4K high-definition video or photos during detection and sampling operations to prove the authenticity and accuracy of data. The operator can monitor the environmental conditions of the detection and sampling points through the images returned by the camera in real time, which is convenient for making the next order and providing help for safe flight.

SD4 Control

Please read the instructions for use of SD 4 carefully and watch the instructional video.

Control

Camera Status Indicator

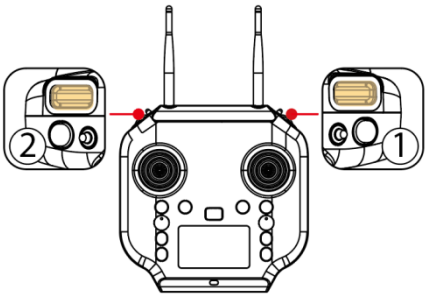


There is a camera status indicator on the back of the camera to indicate the camera's working status. It flashes green or red.

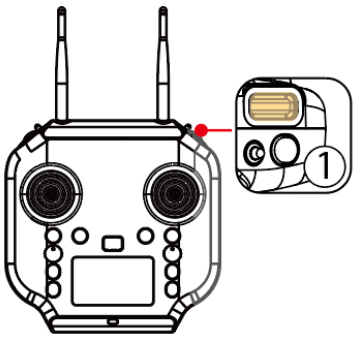
LED		
	Solid Green	Ready to shoot
...	Flashing Green	No SD card
	Flashing Red Once	Taking photo
...	Flashing Red	Video recording

Solid Flashing

Camera Control

Remote controller	Description
	Photo①: press once to take a picture. Video②: press once to start recording, press again to stop recording, and save files.

Gimbal Control

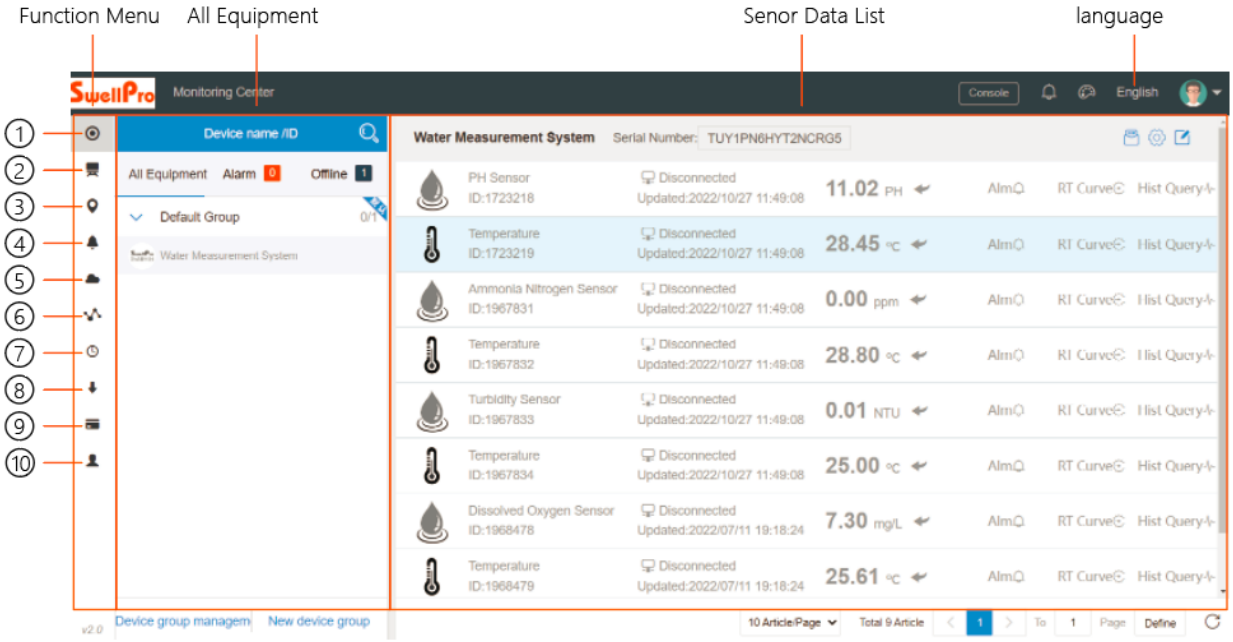
Remote controller	Description
	Tilt①: Roll the right gimbal control as shown to turn the gimbal up or down from 0° to -90°.

Cloud System

The cloud system provides functions such as viewing real-time sensor data, connection status, data update , historical data and downloading data. In addition, equipment map function supports real-time positioning of the device and records the latitude and longitude coordinates of the returned sampling point.

By viewing the data of the cloud system, we can quickly conduct semi quantitative or qualitative analysis of data at the detection point. Later, we can draw more comprehensive and accurate conclusions in combination with the laboratory test of samples.

System Overview



1. Monitoring Center
2. Device Management
3. Equipment Map
4. Trigger (temporarily unavailable)
5. Cloud Configuration
6. RT Computation (temporarily unavailable)
7. Timing Task
8. Data downloading
9. Flow Card
10. User Center

System Usage

1. Turn the Device On

Turn on remote control first, and then turn on drone outside. Check the connection between remote control and drone, open APP to check camera screen, if everything is normal, and please follow the steps below to check whether Water Quality Monitor

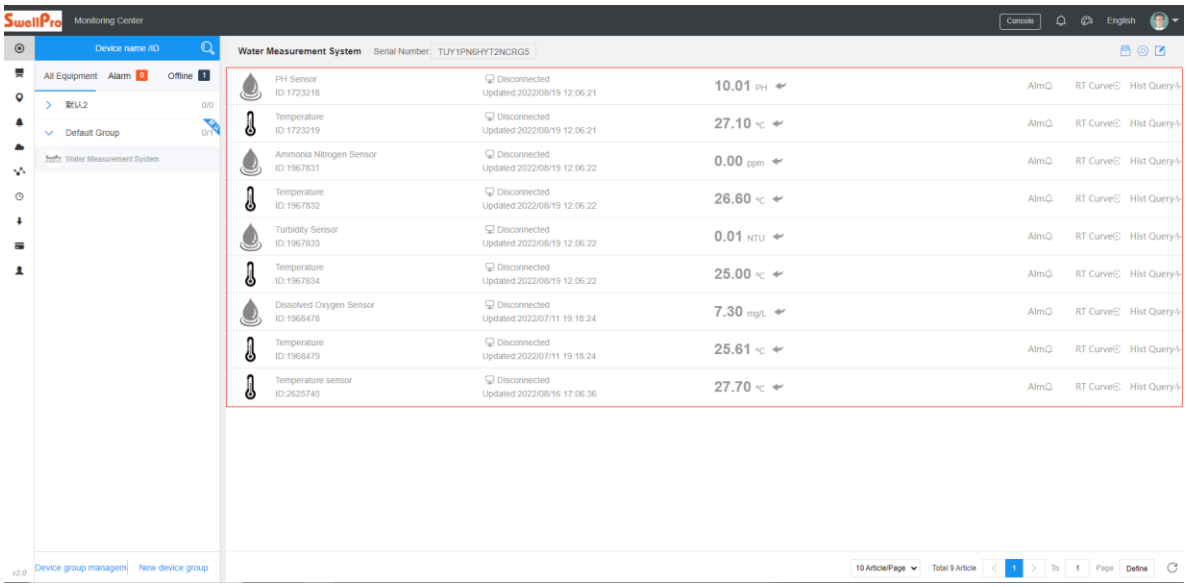
System is working properly. (If the connection between remote control and drone is not connected properly, please refer to this manual and the manual of Sailor 4 to solve problem. If the problem still cannot be solved, please contact the after-sales personnel.

2. System Login

Water Quality Monitor System: swellprowqi.com （Notice: The account is provided by merchant and cannot be registered independently）

3. Monitoring Center

Sensor detection data such as: pH value, ammonia nitrogen value, temperature value, oxygen content, turbidity value, etc.



1) All equipment： Online and offline sensor will be show in different color.

- Device group management：Use for delete device group or move the device to other group.
- New device group：Use for create device group.

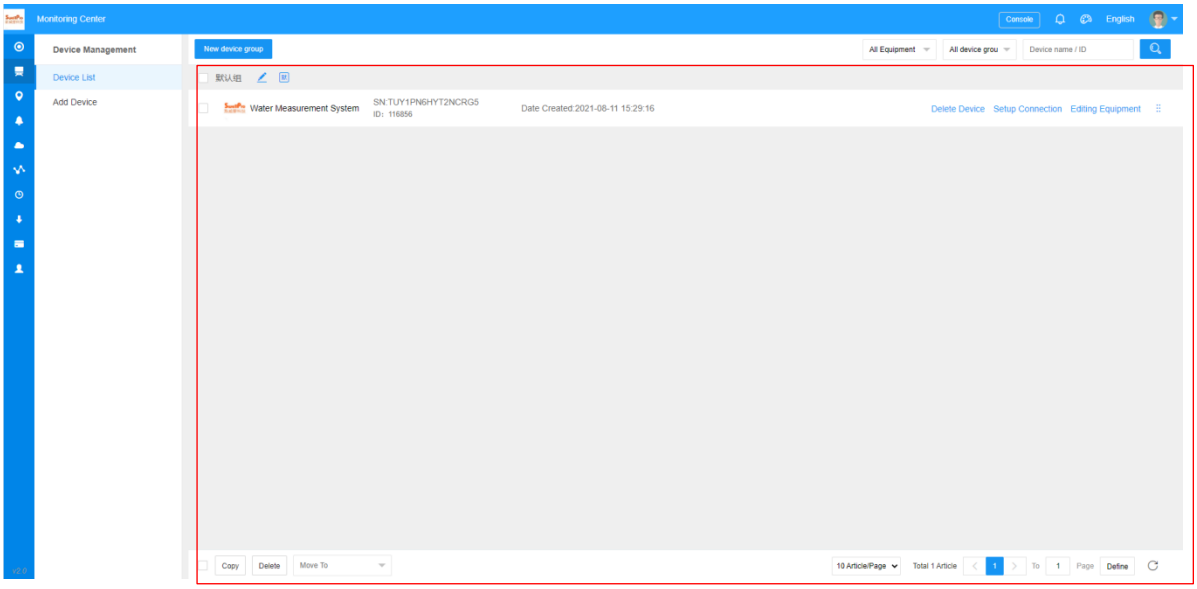
2) Senor data list：Show real-time data of sensor within a half of year in figure.There are Alm/RT Curve/Historical Curve functions can be selected.

⚠ Each sensor is equipped with temperature detection, and the temperature deviation is within ± 1 ° C.

- Alm： Show query data of last month
- RT Curve： Show real-time data of sensor in curve.
- Historical Curve： Show historical data of sensor in curve.

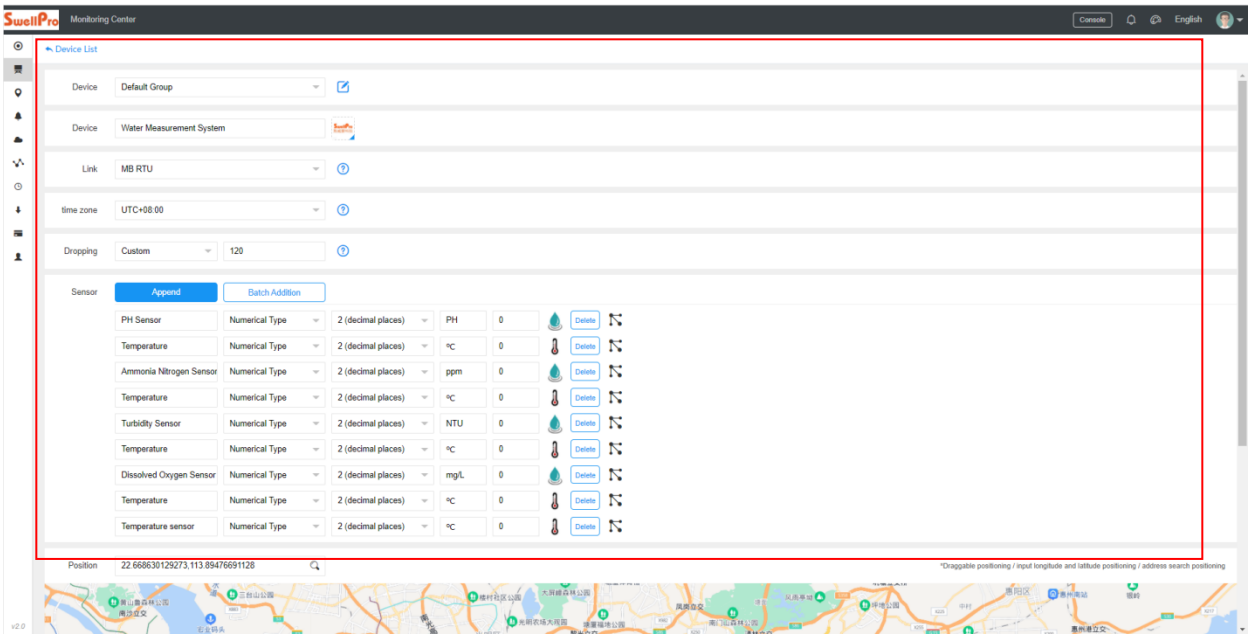
4. Device Management

Use for adding/deleting/editing sensors, The added devices (ID and date created) are displayed on the right, and you can click to delete devices or edit equipment(setup connection is unavailable)



1) Delete device: Delete connected devices （Data cannot be repaired）

1) Editing equipment: Use for adding sensor.



- Device group/name：Custom Settings
- Link：Only select MBRTU

- Time zone：The time where the user is located. For example, Beijing time is the East 8th Zone, you should select UTC+8:00 (UTC is the zero meridian)
- Dropping：This parameter has been set according to the user's requirements when leaving factory, and the user does not need to adjust it.
- Sensor Append or Batch Addition：
  - Sensor name：Custom Settings
  - Data display mode：Select numerical type and 2(decimal places)
  - Sensor unit: fill in according to the type of sensor, for example, the unit of pH sensor is (pH)

⚠ It is not recommended to add more than five sensors, because the number of sensors is proportional to the time of data upload.

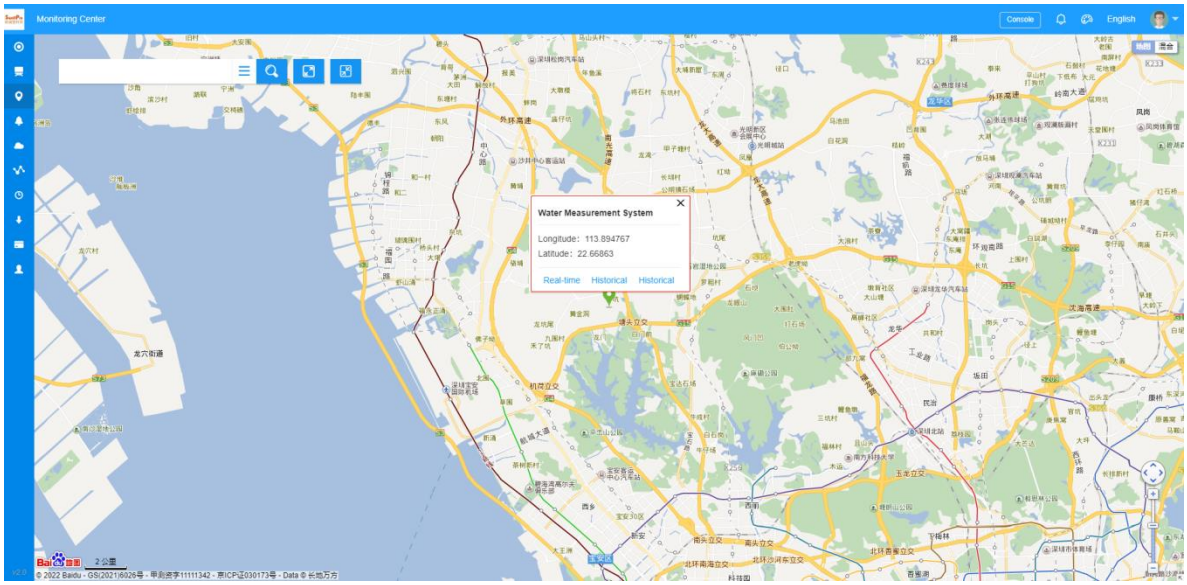
- Save Device: Save device at the bottom left of the interface

⚠ After adding sensors, users must report to swellpro for background settings.

5. Equipment Map

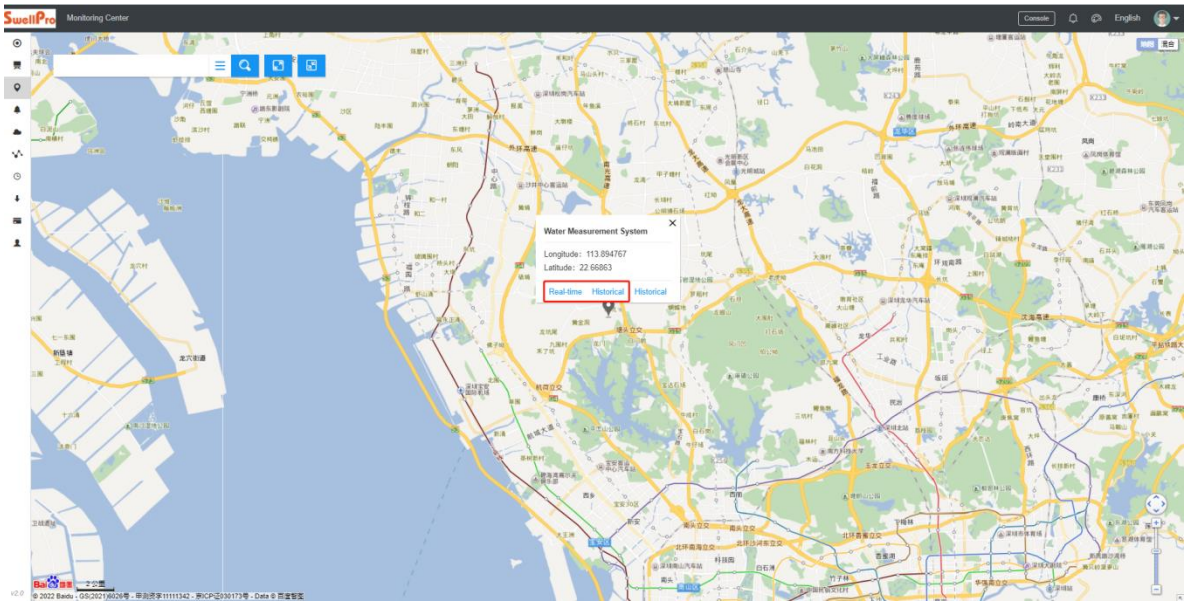
Map: Display the current location and historical flight path of the aircraft.

- Under normal circumstances, the aircraft positioning module can work normally within 5 minutes of power-on(The location icon is green);
- Click the positioning point to query the real-time data, historical data and historical track of the device.

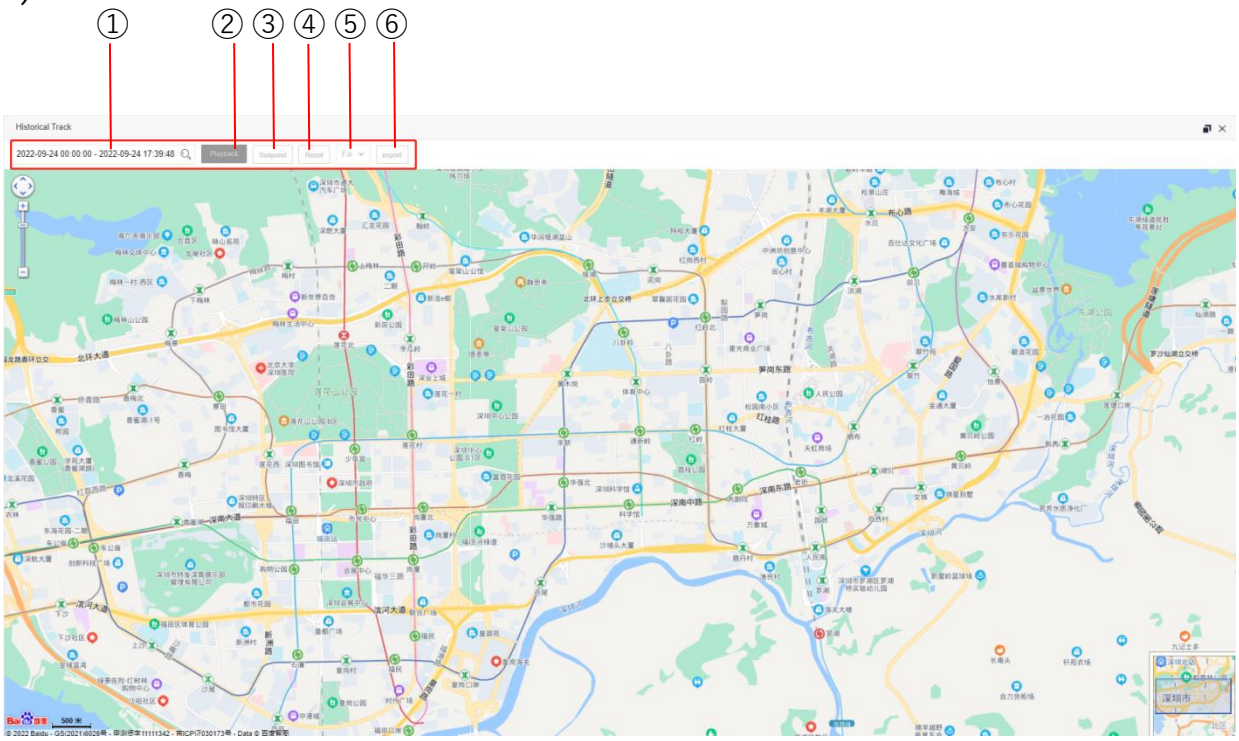


⚠ If the positioning point is inconsistent with the actual location, the aircraft should be placed outdoors to strengthen the signal.

1) Real-time data and historical data:These two functions are the same as those of "3 Monitoring Center". Please refer to "3 Monitoring Center" for details.



2) Historical track



①Select time
②Play historical flight path
③Suspend
④Reset
⑤Playback speed
⑥Export historical track

6. Trigger

Triggers are used for data monitoring alarms for long-term resident sensors, this device is not available.

7. Cloud Configuration

This function is available.

8. RT Computation

RT Computation is a more professional function, if you want to use this function, please contact the seller.

9. Timing Task

Send sensor data to mailbox regularly (only one sensor can be selected at a time)

10. Data Downloading

Used for downloading senor data or viewing data.

1) Send all sensor data to mailbox

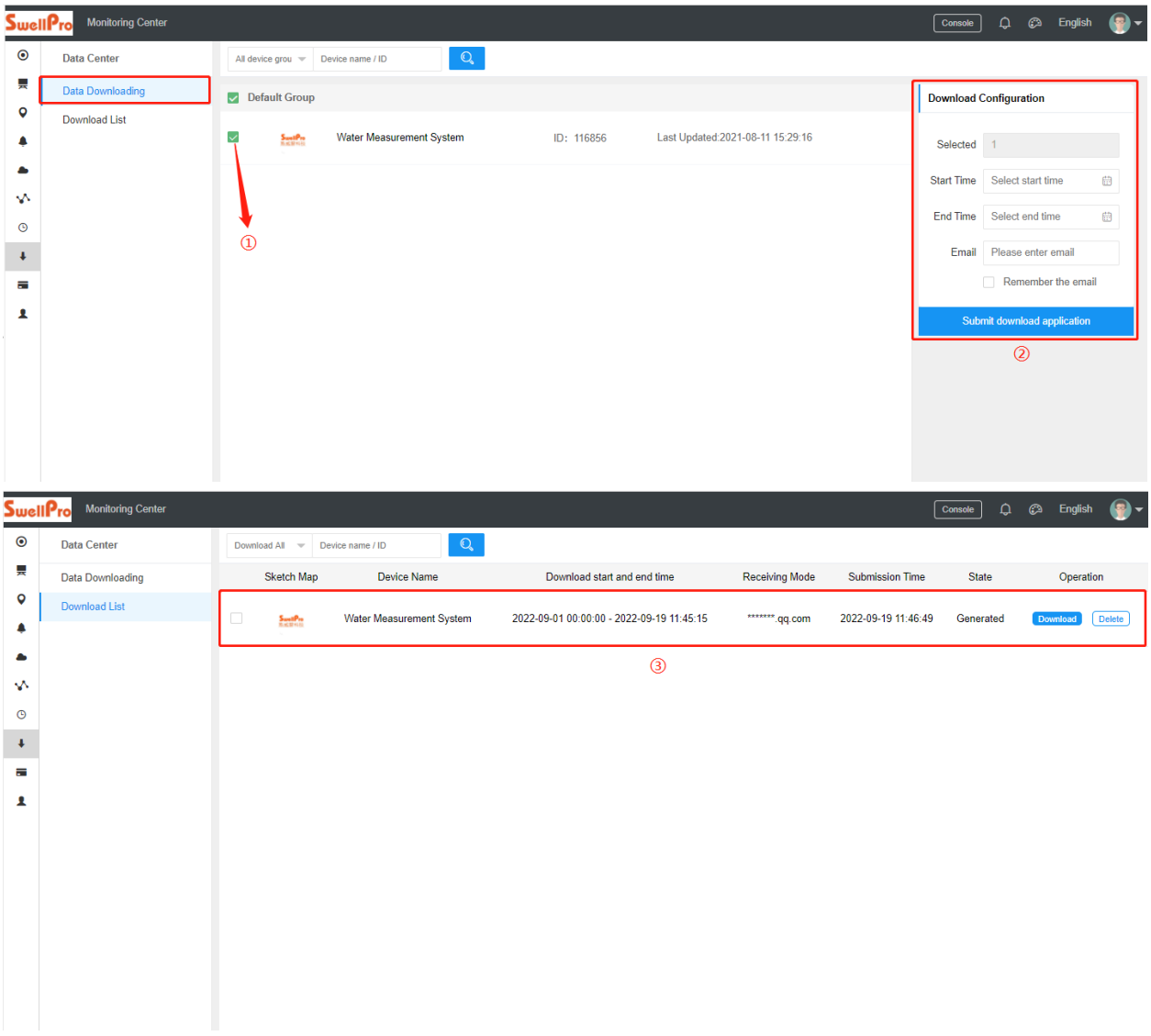
⚠ It is recommended to set a regular download of data and back up the data to the mailbox; At the same time, its data will also be stored on this system to prevent data loss caused by errors or data time exceeding the storage period.

Instruction step by step：

①Select device

②Download configuration: Select start and end time and write mail address, and then submit download application

③After submission, the list will be displayed on the "Download List" page.



2) Data statistics:used for viewing sensor data

【1】Data statistics list: select the sensor to view the data

【2】Time Period: select the time period for displaying data (no more than 31 days)

【3】Time Interval：the interval between data display(minute/hour/day, no more than 31 days), eg: select 1 minute, and the data will be displayed once a minute; select 1 hour, and the data will be displayed once an hour.

【4】Data type（Real time value/average value/maximum or minimum value, Data presentation（Figures or charts）

【5】Query: data query

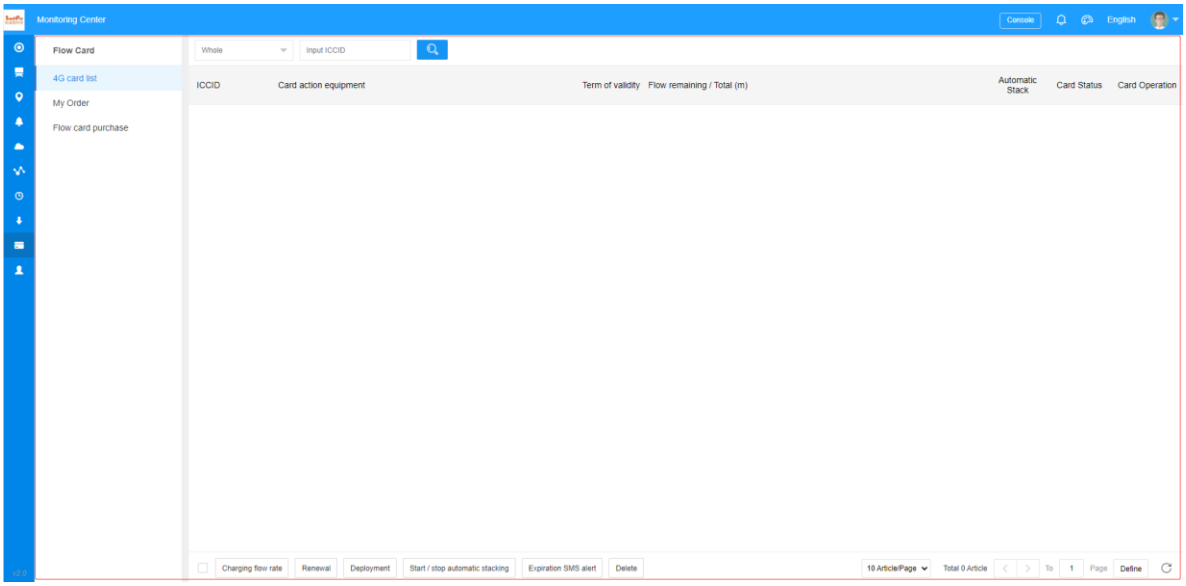
【6】Data download

Instruction step by step：

① Setup time period and interval
② Select data type
③ data query
④ Select sensor

11. Flow Card

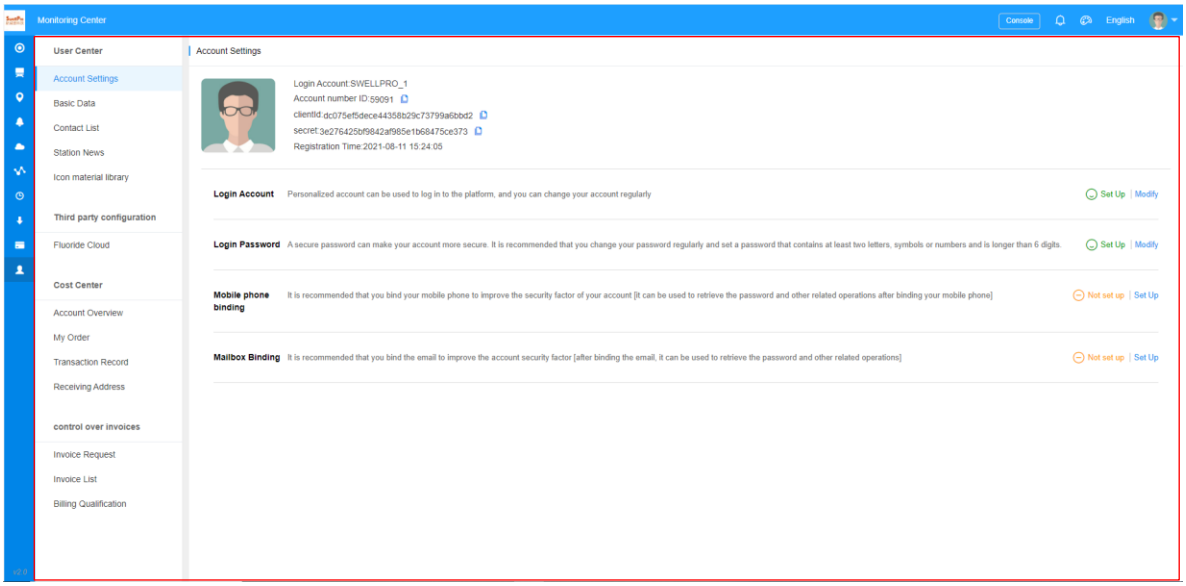
4G card: Purchase 4G card, query purchase orders and view 4G card related data.



12. User Center

Used for modify account or password and bind email

1) Account settings: modify login password and bind account
2) Charge Center: 4G card usage record.
3) Invoice management: This function is temporarily unavailable



⚠ After binding the mailbox, the user can retrieve the password through the mailbox

⚠ The real-time data of on-site detection can be used as a semi quantitative or qualitative preliminary assessment of water quality. After the water sample is sent back to the laboratory for detailed analysis and testing, an accurate conclusion report can be obtained by combining the real-time data of on-site testing.

Appendix

Specification

SwellPro Water Quality Monitor System	
Waterproof rating:	IP67
Weight:（Battery and Propellers included）:	3.41KG
Stabilization:	450 mm
Max Ascend Speed:	4m/s
Max Descend Speed:	4 m/s
Max Flight Speed:	22 m/s（ATTI），10 m/s（GPS）
Max Tilt Angle:	ATTI：12.5°，ATTI（quick mode）：25°
Max Altitude from Takeoff Point:	120m (GPS) / ATTI - no limitation
Max Wind Speed Resistance:	72 km/h | 20 m/s | 39 knot
Max Flight Time:	12 minutes （no load）
Hovering Precision:	±0.5 m (vertical); ±0.5 m (horizontal)
Max Flight Distance:	5.0 KM
Max Payload Capacity:	500mL
Flight Control:	Hawk
Digital Video Transmission:	MultiSync
Motor:	#3509 - 740KV (special coated)
ESC:	40A (flux)
Propellers:	#1242carbon fiber quick release propellers
Operating Frequency:	5180 - 5875 MHz
Transmitter Power（EIRP）:	FCC/IC: ≤ 24 dBm CE/SRRC/MIC: ≤ 20 dBm

Working Temperature:	-10°C~40°C
Satellite Positioning Systems:	GPS/GLONASS
Pass-through Serial Port:	Connect to a third-party device and transfer the data of the third-party device to the remote control
UART::	Allows for TTL serial port to TCP, with the baud rate of 115200
Wi-Fi Hotspot	IP: 192.168.1.101: 2222
Power Input:	12V/2A |5V/2A
Number of sensors mounted	Mount 3 at the same time

Remote Controller (MRC)	
Waterproof Rating:	IP66
Operating Frequency:	5180 - 5875 MHz
Transmitter Power (EIRP)	FCC/IC: ≤ 24 dBmCE/SRRC/MIC: ≤ 20 dBm
Real-time Video Transmission:	720P@30fps
Latency:	200 ms (It depends on the actual shooting environment and mobile devices)
Battery:	2S 3600mAh
Working Time:	7 hours
Working Current/Voltage:	0.3A/7.4V
Ethernet Port:	IP: 192.168.2.220: 2222
Wi-Fi Hotspot	IP: 192.168.2.220: 2020: Default password: 12345678
Mobile Device Mount:	Suitable for any size phones; Tablets require a larger mount (sold separately)
Screen:	2.68 inch, 128x64
Working Temperature:	-10°C - 40°C
Remote Charging time:	3 hours
Power Input:	5V/2A

Intelligent Battery (IB4)	
Nominal Capacity:	6600 mAh
Voltage:	14.8V
Type:	Intelligent 4S LiPo
Watt Hours:	97.68 Wh
Size:	153.6*82.4*48.3mm
Weight:	735 g (±5 g)
Working Temperature:	-10°C - 40°C
Charging Time:	1.5 hour
Max Charging Power:	84 W

Charger	
Input:	100 – 240V， 50/60Hz
Output:	16.8V / 5V@1.5A
Rated Power:	84.5 W

Camera	
Waterproof rating:	IP67
Stabilization:	Uniaxial （Tilt）
Controllable range:	Tilt: -90° to 0°
Max control speed:	Tilt: 60 °/s
Sensors:	1/2.3" 12M CMOS
Lens:	F4.53mm, f/2.65, FOV: 92.6°
ISO range:	100 - 3200
shutter speed:	16 - 1/16000 s
Photo size:	4:3/16:9 12MP
Burst mode:	3/5/10 shoots
Video resolution:	4K：3840*2160/30P | 2.7K：2704*1520/60P | FHD：1920*1080 30/60/120p | HD：1280*720/240p
Max data stream:	64 MBps

Photo format:	JPEG / DNG（RAW）
Video format:	MP4，MOV
Memory card:	Micro SD card: supports up to 128GB of capacity, write speeds ≥ 60 MB/s, recommend using Class 10 or above, or with UHS-1 rating.
Working temperature:	-10℃ - 40℃
APP	
Mobile App Name	SDFly2
Live View Quality	720p@30fps
Latency	＜250 ms (depending on environmental conditions and mobile devices)

Version Information

SwellPro products are constantly improving, so as the product user manuals. It is recommended to visit support.swellpro.com to check and download the latest user manual.

1.0 SwellPro Water Quality Monitor System User Manual 1.0 Edition

