# *SWIWIN SW800PRO ENGINE TECHNICAL MANUAL*

*you and us*

*welcome to the age of turbojet models! swiwin is ready to take you to experience different flight fun!*

*firstly, please carefully read this manual to have a comprehensive understanding and impression of the engine, engine components, and operating process, in order to ensure the safe operation and optimal performance of the engine.*

*this manual will introduce you to how to install, operate, and maintain the engine. if you still have any questions, please feel free to contact us. we will wholeheartedly provide you with sales, technical, and after-sales support services for the swiwin sw800pro engine. this instruction manual aims to provide users with detailed usage guidelines and recommendations to ensure the safety of the engine operation and optimal performance.*

# CATALOGUE

# 1.ENGINE INTRODUCTION

*welcome to use the swiwin sw800pro engine. thank you very much for your trust and support. this engine has the following characteristics:*

*1. as a new type of high thrust turbojet engine, sw800pro has advantages such as flameout restart, 5000 meter low-temperature start, high ceiling, and high thrust to weight ratio, providing users with a better experience.*

*2. the engine consists of components such as the intake duct, compressor, combustion chamber, turbine, and tailpipe. the airflow is drawn in by the intake duct, compressed by the compressor, and enters the combustion chamber where it mixes with fuel for combustion. the high-temperature and high-pressure gas generated drives the turbine to rotate (the turbine drives the compressor through the shaft), and the gas expands and accelerates in the exhaust nozzle before being discharged to generate thrust.*

ELECTRONIC COMPONENTS INTEGRATED WITHIN THE ENGINE BODY

•*brushless starter motor* •*ignition head* •*temperature sensor*

**ENGINE**

COMPONENTS INTEGRATED WITHIN THE ECU CONTROLLER:

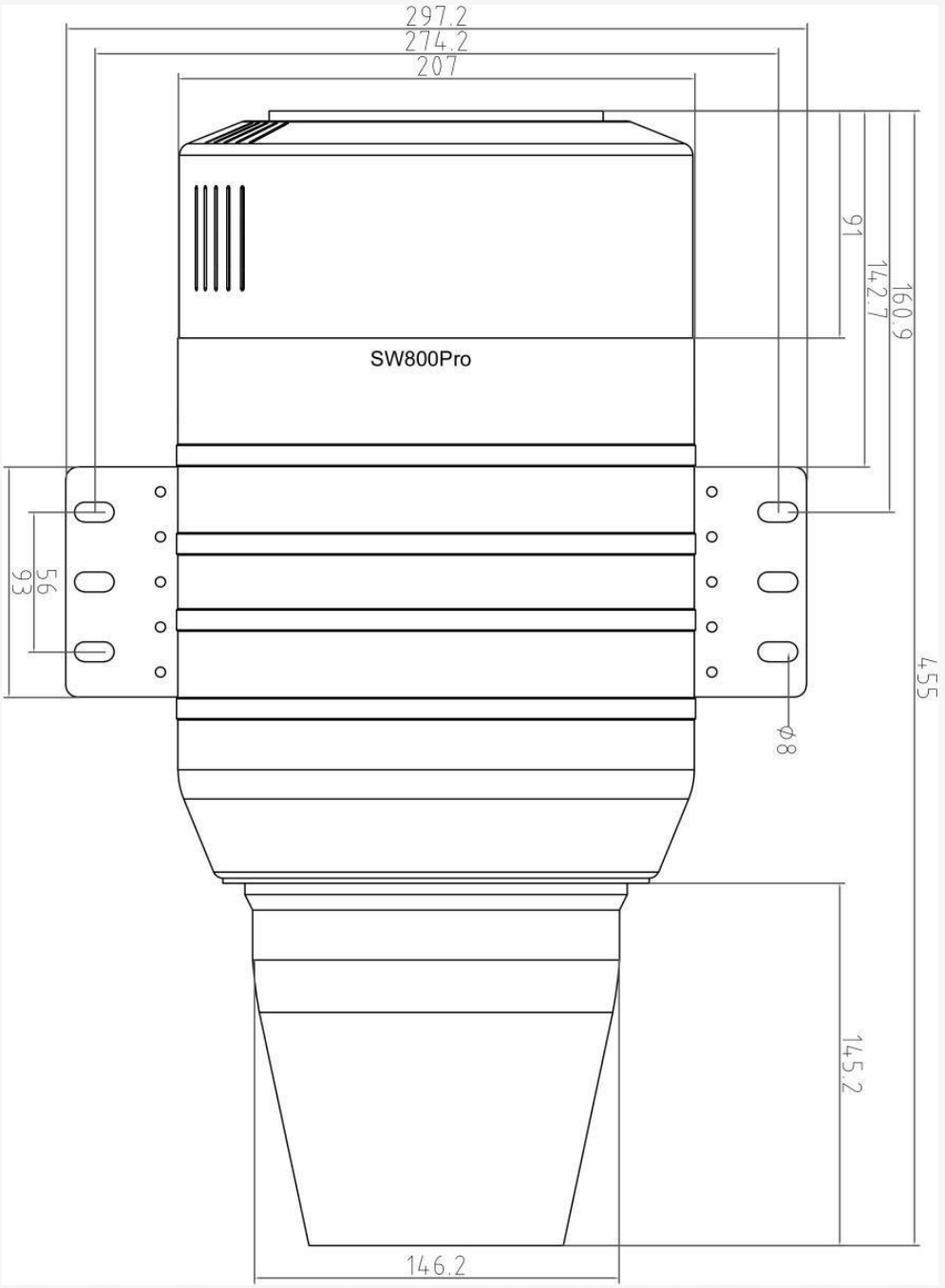
•*oil control valve body assembly* •*ecu board*

**ECU（V5）**

# 2.PRODUCT SPECIFICATIONS

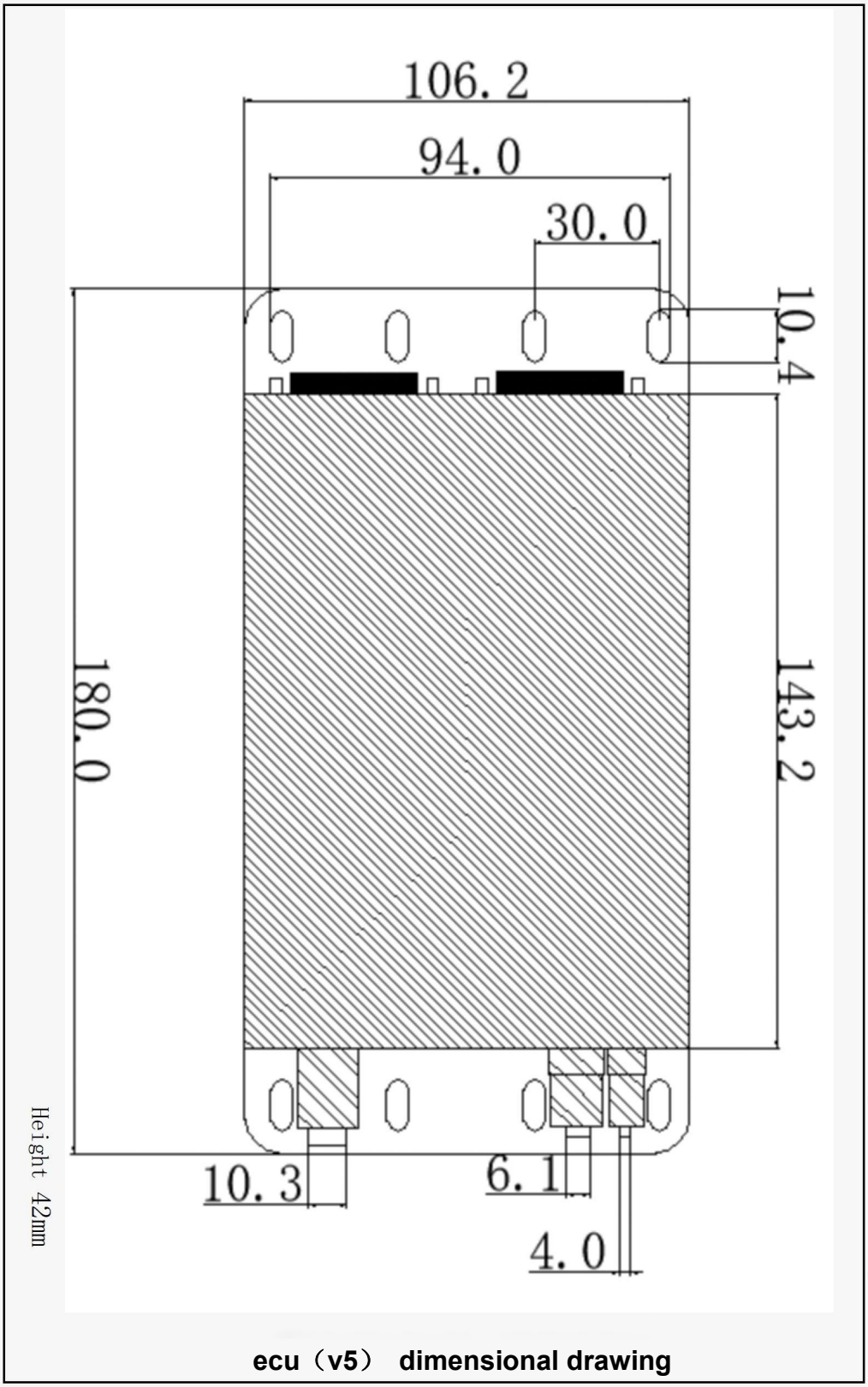
## 2.1 DIMENSIONAL DRAWING

### 2.1.1ENGINE DIMENSIONAL DRAWING




**enging dimensional drawing**

### 2.1.2 ECU（V5）DIMENSIONAL DRAWING




**ecu（v5） dimensional drawing**

## 2.2 BASIC PARAMETERS OF ENGINE

| PROJECT | PARAMETER |
|---|---|
| model | SW800Pro |
| thrust | 80kg |
| diameter (mm) | 207mm |
| length (mm) | 455mm（customizable） |
| weight | 8400g |
| ecu weight | 910g |
| usage temperature | -40℃~50℃ |
| max usable height | 12000m |
| maxi longitudinal overload during catapult takeoff | 20g |
| max allowable flight speed | 300m/s |
| supply voltage | 16V-32V |
| starting system | one key electronic start |
| rpm range | 25,000-65,000 |
| exhaust temperature | 750℃ |
| fuel consumption | 1850g/min |
| fuel | kerosene |
| lube oil | 3%-5% |
| maintenance cycle | 25h/time |

## 2.3 PARAMETERS OF ENGINE OPERATION CONTROL

| PROJECT | PARAMETER |
|---|---|
| pump voltage | 0.6V-0.76V |
| rpm start up ramp | 100% |
| pump start up ramp | 2 |
| glow plug | 5-7.6V |
| valve | 10-40 |
| ignition rpm | 1,300 rpm |
| preheat rpm | 2,000 rpm |
| rpm off starter | 13,000 rpm |
| rpm acc | 10 |
| rpm dec | 10 |
| max rpm | 65,000 rpm |
| idle rpm | 25,000 min |
| minimum speed | 15,000 rpm |
| max temp | 1000℃ |
| low volt | 10.0v |
| restart | close |
| restart glow plug | consistent with the voltage of the burner |
| pump limit | 20v |
| idle stable | 5-8 |
| pop-up time | 0.8S |
| ejection voltage | 5v |
| run voltage | 2.5v |
| rpm stable | 20 |
| cool | 2,000 rpm |

*note: all data are measured at isa condition（temperature：15℃&pressure：1atm）.*

# 3. SAFETY INSTRUCTIONS

## 3.1 SAFETY NOTICE

*1.thank you for using the swiwin micro turbojet engine. the working state of the turbojet engine is essentially highly extreme mechanical work, which poses a certain degree of danger. the operator must be familiar with the operating points and recognize the risks before use. careless operation can easily cause damage to the turbojet body and personal injury. please carefully read the operating instructions in the manual and strictly follow the operating regulations. if this is your first time operating a turbojet engine, please learn how to operate it under the guidance of experienced personnel. before starting the turbojet engine for the first time, please carefully read this manual.*

*2.when the engine is running, there is a loud noise. testing or visiting personnel must confirm that their health is good before entering the safe area for testing or visiting. it is strictly prohibited for personnel with cardiovascular and cerebrovascular diseases or sensitive to noise to conduct engine testing or visiting.*

*3.due to the fact that the exhaust gas from the engine can fill the enclosed space in a very short period of time when it is in a large state, it is strictly prohibited to start and operate the engine inside the enclosed room, otherwise it may cause injury to personnel, and in severe cases, it may lead to suffocation, shock, or even death.*

## 3.2 ENGINE SAFETY OPERATION

*before installing the engine on the aircraft, it is recommended to complete at least one start-up and operation on the ground test platform to familiarize oneself with the engine operation process.*

## 3.3 SELECTION OF ENGINE FIRE EXTINGUISHERS

*1.to prevent fires, carbon dioxide fire extinguishers must be prepared during testing. other types such as foam, dry powder or water-based extinguishers are not recommended. fire extinguishers with foam or dust will damage engine parts, and water-based fire extinguishers will damage electronic components such as circuit boards or ecus.*

*2. the exhaust temperature of the engine tailpipe is relatively high. in order to prevent fires, it is strictly prohibited to start and operate the engine in areas with flammable and explosive materials.*

*3. if the engine fails to start multiple times or if the fuel tank pressure is too high, it may cause a large flame during startup. when the aircraft is started, if there is an open flame at the tail nozzle and it lasts for more than 3 seconds, it can be considered as a large flame. at this point, quickly close the oil circuit ball valve, the flame will disappear immediately, and then proceed with the shutdown operation. after the engine enters automatic cooling, it can be restarted.*

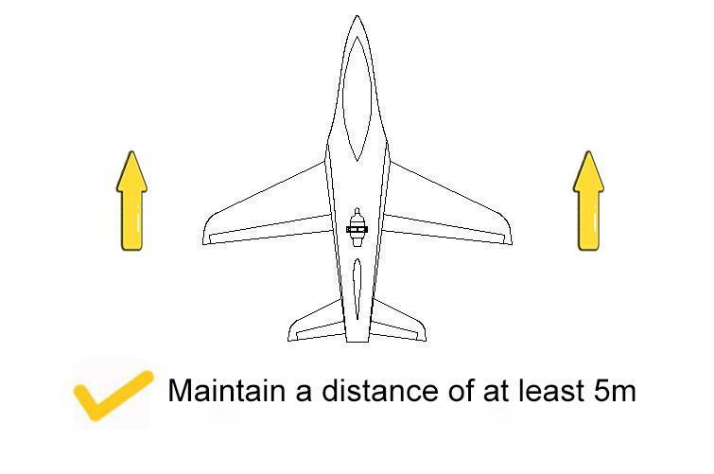
**3.4 ENGINE NOISE PROTECTION**

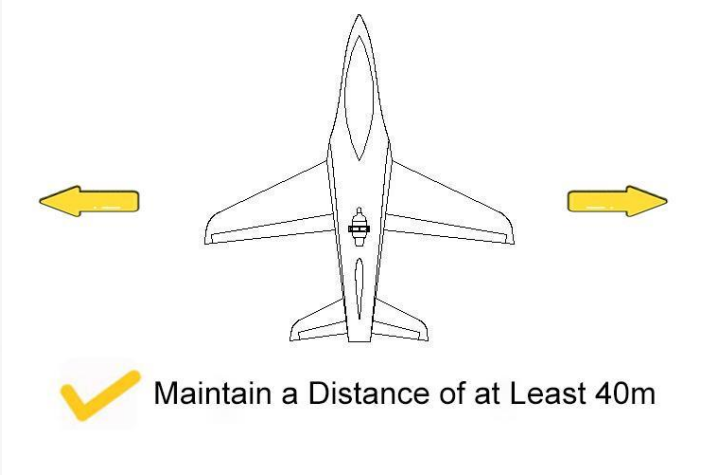
*1. when the engine is running, it produces loud noise. to prevent noise from harming the operator's health, testers must take protective measures and wear hearing protection devices.*

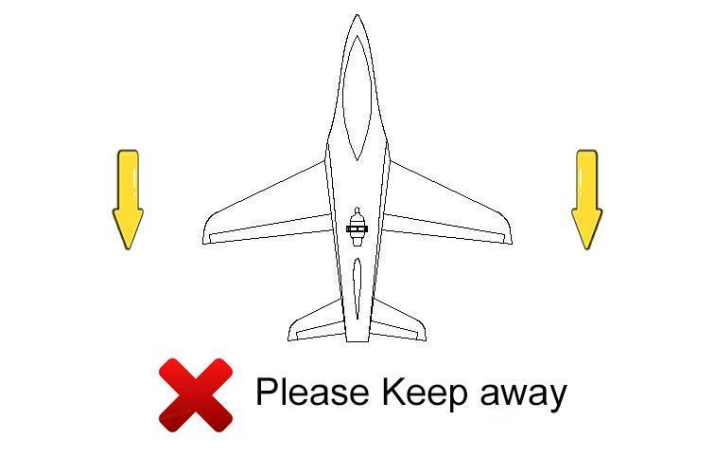
*2. testers should seek medical attention promptly if they experience any adverse reactions (including but not limited to dizziness, tinnitus, nausea, loss of appetite, difficulty breathing, arrhythmia, etc.).*

### 3.5 SAFE DISTANCE

*the engine operates at extremely high rotational speeds. when the engine is running, it must maintain a safe distance from the aircraft, with a distance of 5 meters in front of the engine (intake direction) and 40 meters on both sides. when the engine is running, all personnel must be in a safe area.*



## 3.6 HAZARDOUS AREAS OF THE ENGINE

*1.during engine operation, a large amount of air will be drawn in while high-temperature and high-speed gases will be expelled outward. it is prohibited to place any items that may be inhaled, such as cables, plugs, fuel tanks, and fuel pipes, in the engine air intake.*

*2. it is strictly prohibited to enter hazardous areas during engine operation.*

**THE FOLLOWING FIGURE SHOWS THE HAZARDOUS AREAS DURING ENGINE OPERATION**

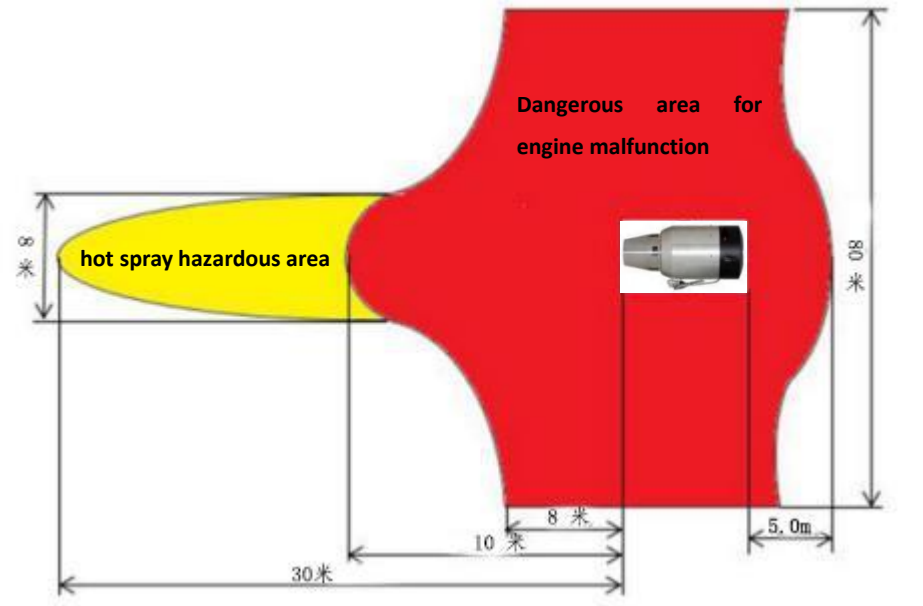
*●confirm that no personnel have entered the hazardous area during operation.*

*●when operating the engine, safety goggles and earplugs must be worn.*

*●ensure that there are no debris that may be inhaled in the intake area.*

*●keep your fingers away from the intake area when operating the engine.*

*●prepare fire extinguishing equipment before operating the engine.*




*the sw800pro engine uses the simplest structure to achieve the most extreme working state, with each component designed and produced to perfection. do not disassemble the intake and main shaft structure without authorization. once the engine is disassembled, it must be reinstalled with precision according to specifications to achieve its original performance. improper installation may cause serious safety hazards! therefore, when your engine needs to be disassembled and repaired, please log in to the swiwin official website and contact after-sales personnel.*

*1) please ensure that there are no personnel involved in the operation process in these hazardous areas, and be familiar with safety precautions before starting the engine. be sure to wear safety equipment (earmuffs, gloves, helmets, etc.) when operating a jet engine*

*2) ensure that there are no components or foreign objects in the intake area that may be compressed and sucked into the intake port! because the engine will produce a large suction force! keep your fingers away from the air intake! do not rotate the pressure wheel with your fingers!*

*3) ensure that there is fire extinguishing equipment (containing at least 5 kilograms of carbon dioxide fire extinguisher).*

**3.7 FIRE HANDLING METHODS**

*after an engine failure causes a fire, the fire can quickly spread between the battery, engine, and fuselage. the disposal method for encountering the above situation on the ground is:*

*1.on site operators should maintain a high level of calmness, avoid panic, immediately evacuate unrelated personnel around, and first ensure personnel safety.*

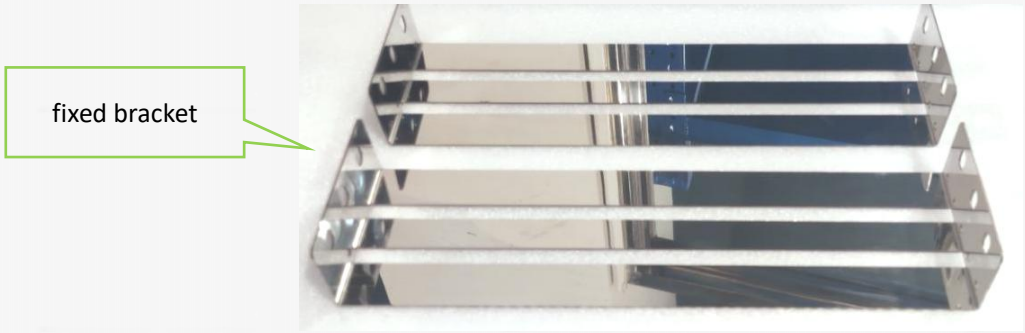
*2. under the premise of ensuring personal safety, the power should be immediately cut off, the oil circuit ball valve should be closed, and carbon dioxide fire extinguishers should be used to extinguish the burning parts. at the same time, attention should be paid to cooling and protecting the fuel tank and engine to prevent the fire from spreading to these parts. if the shape of the aircraft remains intact, align the nozzle of the carbon dioxide fire extinguisher with the position of the aircraft intake duct, and intermittently press the handle every 0.5 seconds to pulse inject carbon dioxide into the interior of the aircraft.*

*3.if there is scattered fuel on the ground, try to tow the aircraft away from the danger zone first, and then extinguish the flames on both the aircraft and the ground.*

# 4. INSTALLATION AND DEBUGGING

## SWIWIN SW800PRO ENGINE INSTALLATION FIXED ENGINE

*sw800pro engine are equipped with dedicated fixing clamps. before operating the engine, the clamp has already been installed on the engine. you only need to fix the clamp on the test bench. pay attention to the optimal installation position of the engine: rotate the engine to make the oil inlet at the 12 o'clock position.*

# 5. ENGINE USAGE INSTRUCTIONS

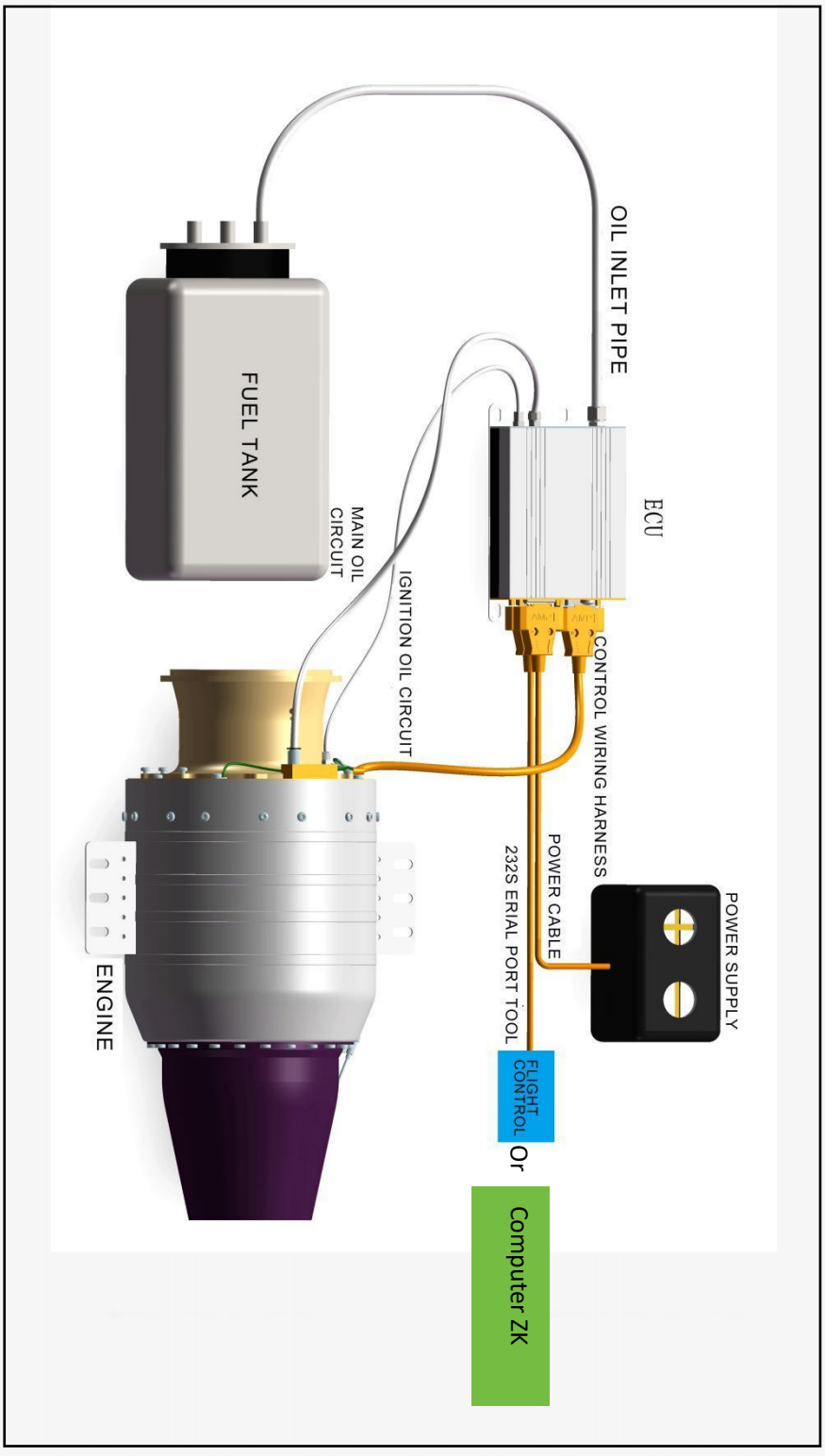
## 5.1 ENGINE PACKING LIST

***open the package, the engine packing list is as follows***

| | | |
|---|---|---|
|  Engine |  ECU（V5） |  GSU |
|  Fixed bracket |  Upgrade tool (one to two) |  Connector |
|  Power connection plug |  Signal connection plug |  Power Line |
|  Serial Cable |  Φ10mm×Φ6.5mm（PU Tubing）<br>Φ6mm×Φ4mm（PU Tubing）<br>Φ4mm×Φ2.5mm（Teflon Tubing） | |

## 5.2 ENGINE CONNECTION DIAGRAM

*open the packaging, familiarize yourself with each component, and connect them as shown in the following diagram*



*the sw800pro engine is mainly composed of the engine body and ecu (v5)*

*body:*

*the engine body mainly includes the stator system (diffuser, shaft tube, combustion chamber, nozzle ring, hardened intake port, etc.), rotor system (impeller, main shaft, inlet bearing, rear turbine, etc.), and all components are tightly matched with high precision.*

*start the system:*

*the engine uses a self-developed brushless starter motor, which can achieve more stable, smooth, energy-saving, and extended service life compared to traditional motors. the startup system also has a power generation function. the starter motor starts working, and the engine starts generating electricity. after the engine enters idle, the ecu will turn off the external input power supply to achieve autonomous power supply.*

*brushless fule pump:*

*the sw800pro engine adopts an integrated oil control system design, which integrates the main oil pump, starter oil pump, solenoid valve, and oil filter on the valve body, and then installs them inside the ecu to achieve the simplest installation state of the engine. it also comes with a built-in oil filter, effectively preventing engine failures caused by fuel system blockages.*

*solenoid valve*

*the solenoid valve of the ecu includes two oil channels, one for the main fuel line and one for the ignition injector line.*

*control system*

*using a 32-bit high-speed chip, it has automatic shutdown and restart functions, multiple function protections, and a matching gsu color display screen. it has many advantages such as software upgradability, precise speed control, and rapid throttle response.*

*oil circuit system*

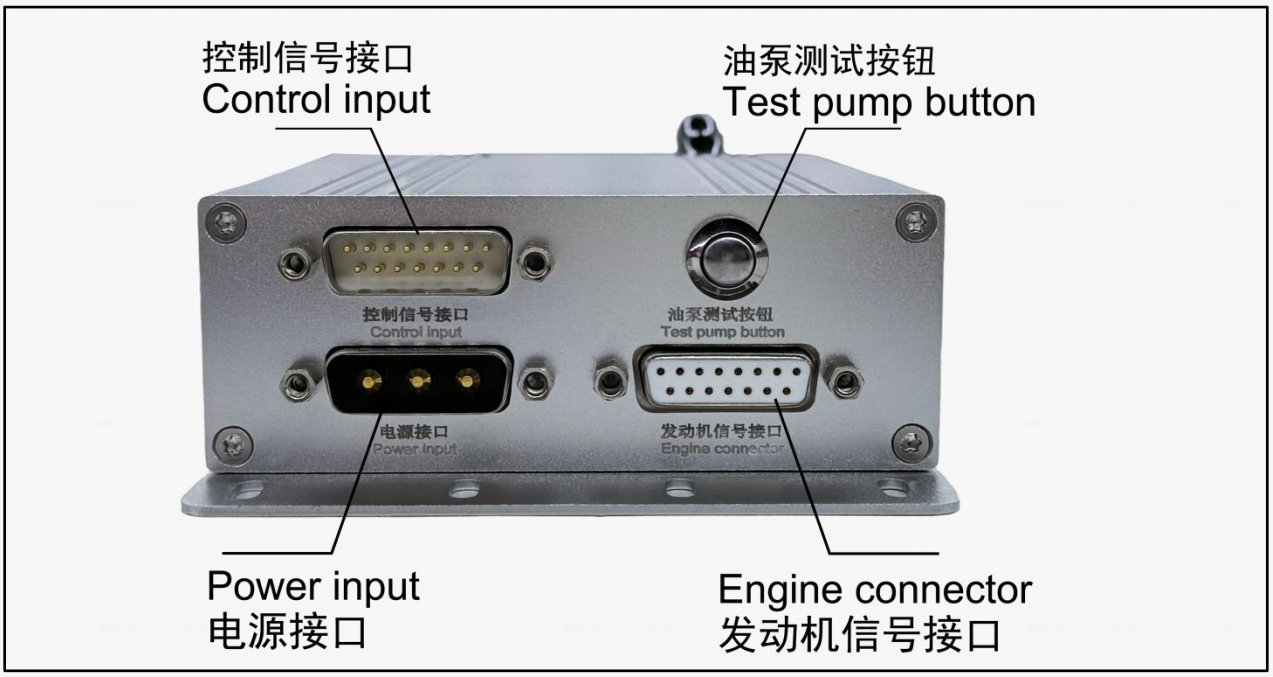
*the fuel enters the engine through the anti bubble fuel tank and first passes through an internal oil filter with a filtering accuracy of 15 microns to prevent the oil pump from stalling due to impurities and causing engine failure. after filtering, the fuel enters the solenoid valve through the oil pump and connecting pipe, and is divided into two parts, one part enters the ignition oil circuit and the other part enters the main oil circuit. after successful ignition, the ignition solenoid valve automatically closes. the fuel entering the main oil circuit enters the combustion chamber through the inlet pipe and oil system for combustion and work.*

*ignition system*

*the sw800pro engine adopts dual atomizing nozzles combined with specially designed dual ignition heads, which have the advantages of fast ignition speed and high efficiency.*

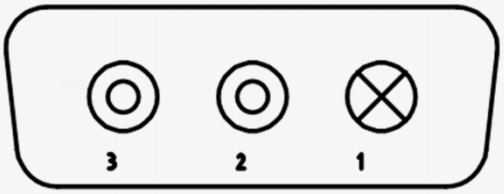
## 5.3 SW800PRO ELECTRICAL CONNECTION METHOD

*the engine data connection is completed through ecu (v5), which has three electrical connection sockets on the side, namely db15 (male) plug, db15 (female) plug, and db3 (male) plug.*



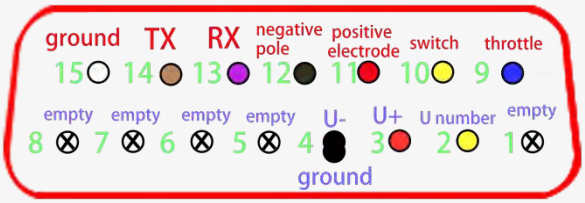
## 5.4 DEFINITION OF PIN CORRESPONDING INTERFACE

definition of power interface



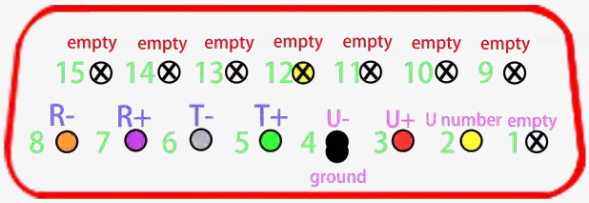

**1：empty**
**2：positive electrode （VCC）**
**3：negative electrode（GND）**

rs232 definition of signal line wiring




**2：GSU data**
**3：GSU power supply positive**
**4：GSU negative power supply ground**
**9：PPM throttle**
**10：PPM switch**
**11：PPM power supply positive**
**12：PPM negative power supply**
**13：RX**
**14：TX**
**15：ground**

rs422 definition of signal line wiring




**2：GSU data**
**3：GSU power supply positive**
**4：GSU negative power supply ground wire**
**5：T+**
**6：T-**
**7：R+**
**8：R-**

*note: unless otherwise specified, the default ecu interface for sw800pro engine is defined as rs232, communication protocol zk, and baud rate 9600. if you need rs422 interface definition, please contact swiwin after-sales personnel to purchase the engine main harness.*

## 5.5 REGARDING THE CONTROL PROTOCOL

1. THROTTLE SIGNAL

*the throttle adopts a pulse width (pwm) control method, with a pulse width of 1ms~2ms. 1ms corresponds to the minimum throttle (0%), 2ms corresponds to the maximum throttle (100%), and the pulse high level is 3.3v and 5v (3.3v and 5v are available on average), while the pulse low level is 0v.*

2. START SWITCH

*the startup switch adopts a pulse width (pwm) control method, with a pulse width of 1ms~2ms. 1ms corresponds to off and 2ms corresponds to on. the pulse high level is 3.3v and 5v (3.3v and 5v are available on average), and the pulse low level is 0v.*

3. REMOTE CONTROL DATA

*① the engine has telemetry function and transmits data through a 232 standard serial port with a baud rate ranging from 9600bps to 57600bps.*

*② the data to be measured includes but is not limited to engine speed, engine throttle, fuel pump voltage, engine status, and error messages.*

*③ to test the communication protocol openness of the data, provide detailed communication protocol documentation.*

4. DATA RECORDING

*① the engine has a data recording function, which can record data from 2 hours before the engine failure.*

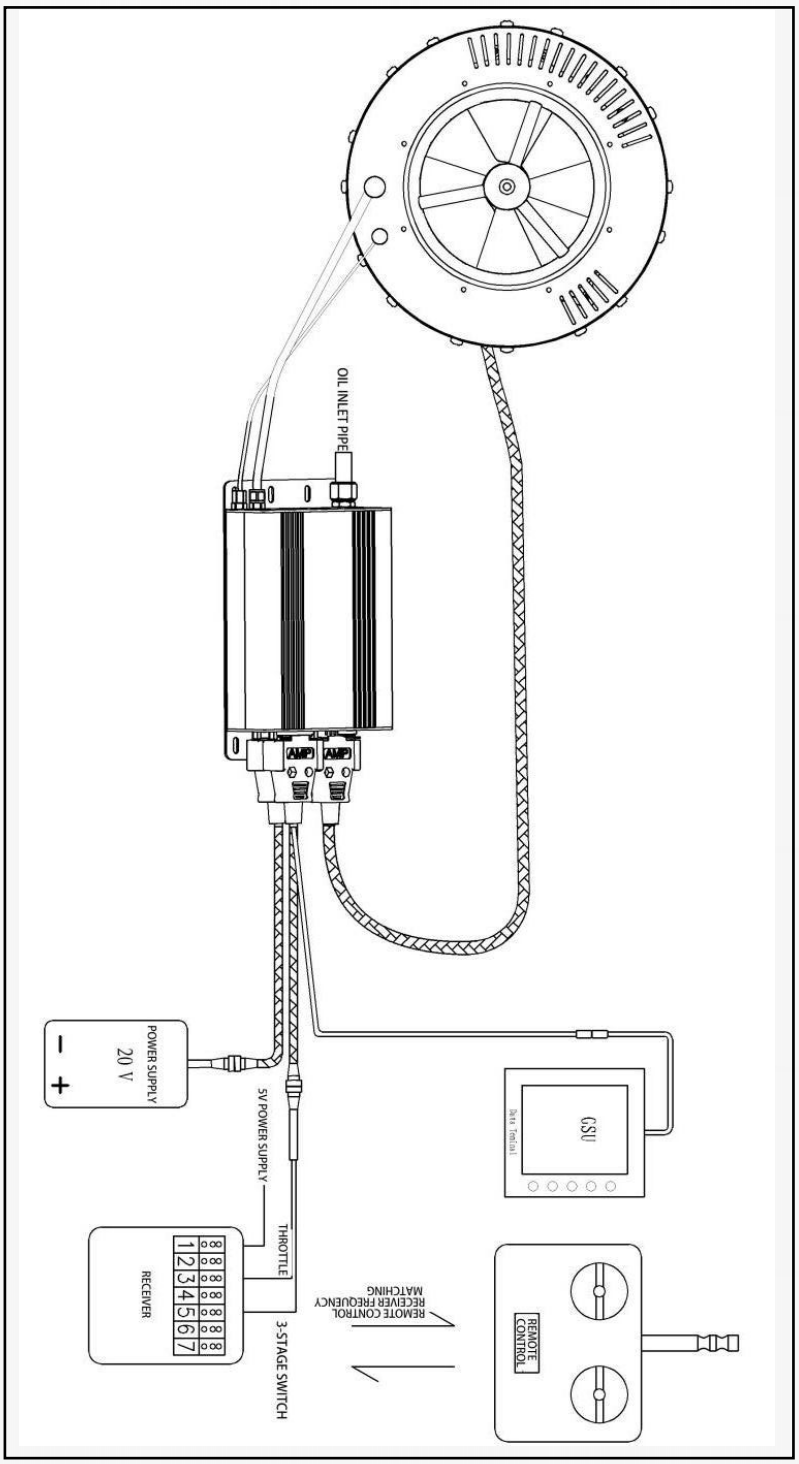
*② the data recording content includes but is not limited to engine speed, engine throttle, oil pump voltage, engine status, and error messages.*

*③ provide engine data analysis software for post flight data analysis.*

## 5.6 ENGINE CONNECTION INSTRUCTIONS FOR DIFFERENT STARTING MODES

### 5.6.1 ENGINE CONTROLLED BY REMOTE CONTROL

USE THE REMOTE CONTROL TO START THE CONNECTION METHOD (THE RECEIVER, BATTERY, REMOTE CONTROL, AND COMPUTER NEED TO BE PROVIDED)




*1. connect the engine power cord to a 20v dc power supply.*

*2. the remote control receiver determines the throttle and switch channels based on frequency.*

*3. the engine signal line is connected to the receiver through a signal adapter, paying attention to the corresponding channel.*

*4. connect the engine data cable to the display.*

*5. connect the power supply to the engine and receiver.*

*6. test all engine functions according to the pre start testing requirements in 6.4.*

*7. calibrate remote control:*

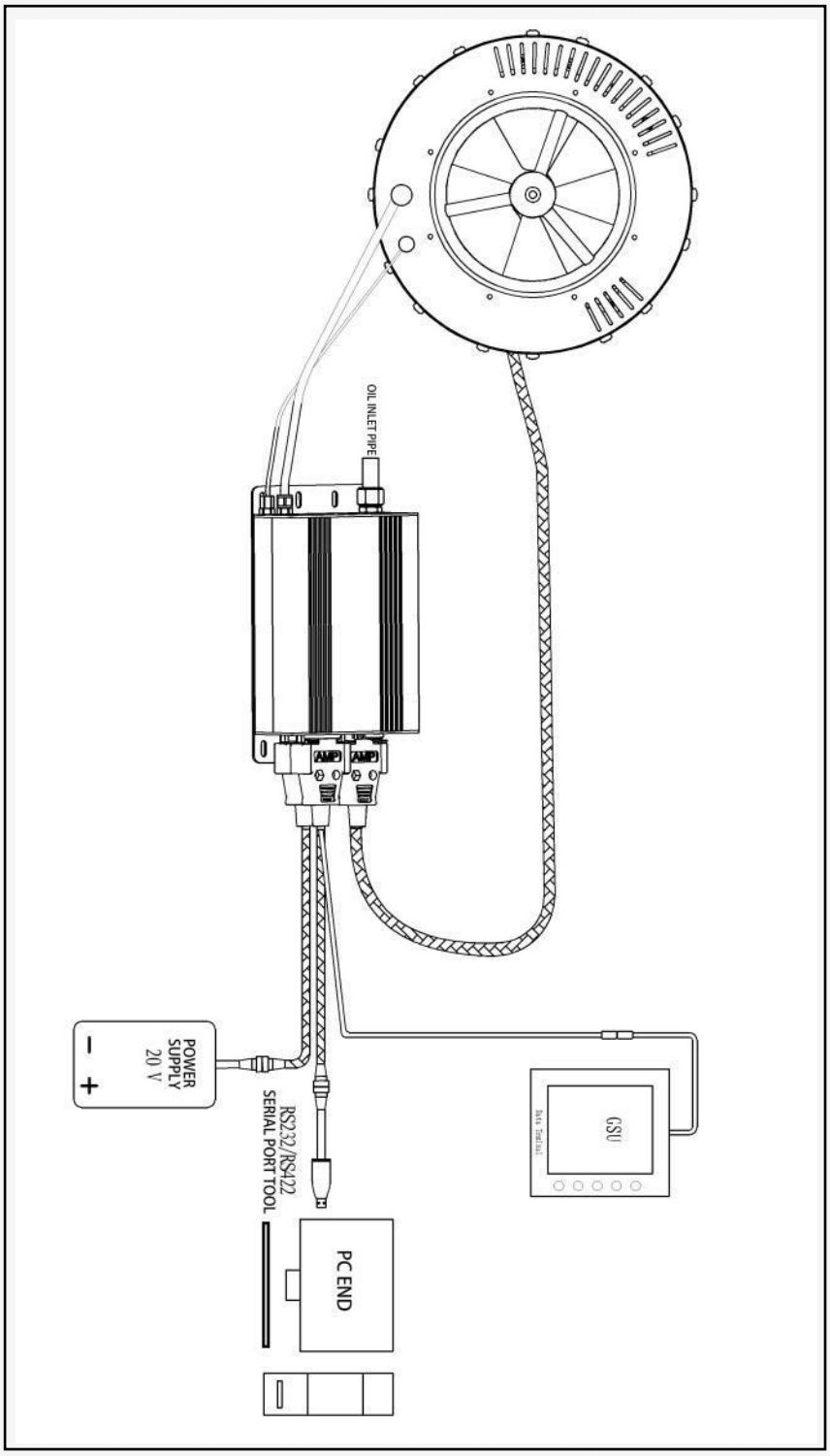
*① turn on the power switch of the remote control and open the throttle lock (three-stage) of the remote control.*

*② select "calibrate remote control" on the gsu homepage ->click the "ok" button ->select "maximum" ->turn the throttle to maximum ->click "ok" to complete the maximum speed calibration; select the "standby" option, turn off the throttle to the minimum, and click "ok" to complete the idle calibration.*

*③ close the remote control throttle lock (three-stage). turn off the throttle to the minimum and click "ok" to complete the minimum speed calibration.*

*8. start the engine and observe its operating status. the starting process of the engine is as follows: after starting, the starter motor starts working first, and when the speed reaches around 800 revolutions per minute, the igniter starts working. at this time, the display shows a high current of about 10a. when the speed reaches 1300 revolutions per minute, the ignition solenoid valve opens. after 0.5 seconds, the ignition oil pump starts working. at this time, a continuous flame is sprayed from the engine tailpipe, and the gsu displays a continuous temperature rise. the ecu determines that the engine ignition is successful. when the speed rises to 2500 rpm, the main solenoid valve intermittently opens, the main oil pump starts working, and the engine enters the preheating stage. when the speed reaches around 7000 rpm, the ignition solenoid valve and ignition oil pump stop working. when the speed reaches 13000 rpm, the starter motor stops working. when the speed reaches 25000 rpm, the engine reaches idle and the start is successful. afterwards, the engine does not require onboard battery power and can generate electricity autonomously, with a maximum output voltage of approximately 50v.*

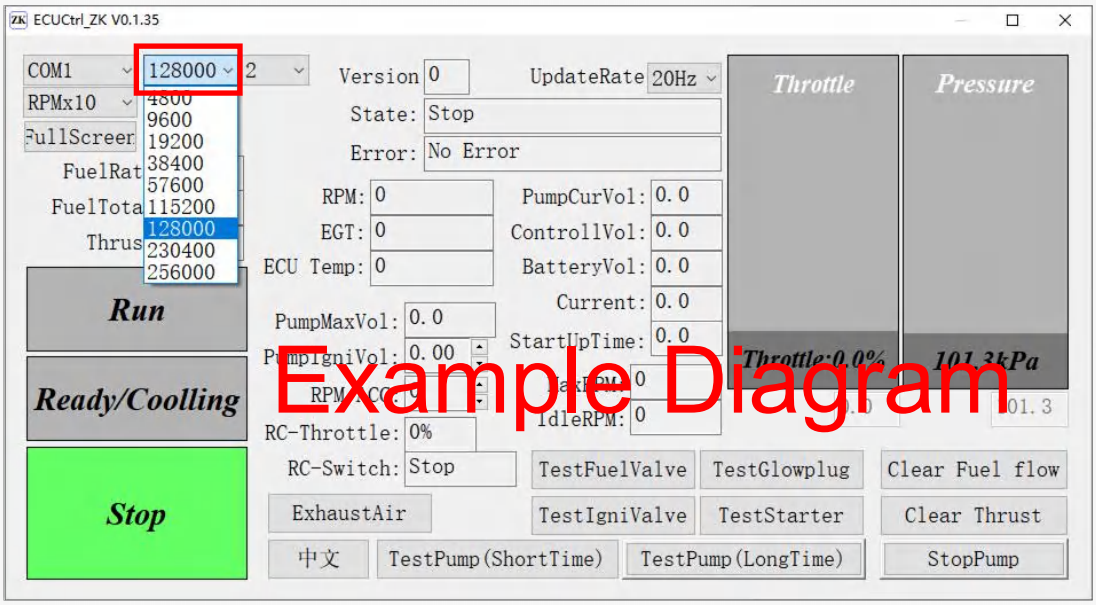
## 5.6.2 ACTIVATE CONNECTION MODE USING RS232/422 COMMUNICATION PROTOCOL



*1. connect the engine power cord to a 20v dc power supply.*

*2. the engine signal line is connected to the computer through an rs232/422 serial port tool.*

*3. open the ecuctrlzk software. check if the com port is selected correctly, check the baud rate (default is 9600), stop bit 2, and protocol version as numbers, such as 2 and 4. if the numbers are not displayed, please install or upgrade the serial port tool driver on a computer with a network connection. click on 'throttle control' again.*




*4. test all engine functions according to the pre start testing requirements in 6.4.*

*5. one click engine start: click "start" to start the engine ignition and operation. observe the operating status of the engine. the starting process of the engine is as follows: after starting, the starter motor starts working first, and when the speed reaches around 800 revolutions per minute, the igniter starts working. at this time, the display shows a high current of about 10a. when the speed reaches 1300 revolutions per minute, the ignition solenoid valve opens. after 0.5 seconds, the ignition oil pump starts working. at this time, a continuous flame is sprayed from the engine tailpipe, and the gsu displays a continuous temperature rise. the ecu determines that the engine ignition is successful. when the speed rises to 2500 rpm, the main solenoid valve intermittently opens, the main oil pump starts working, and the engine enters the preheating stage. when the speed reaches around 7000 rpm, the ignition solenoid valve and ignition oil pump stop working. when the speed reaches 13000 rpm, the starter motor stops working. when the speed reaches 25000 rpm, the engine reaches idle and the start is successful. afterwards, the engine does not require onboard battery power and can generate electricity autonomously to meet operational needs.*

## 5.7 GSU USER MANUAL

*gsu is a terminal for displaying and editing engine parameters, which can be connected or disconnected from the engine at any time. even during engine operation, you can adjust some engine parameters through gsu.*

### 5.7.1 INITIAL INTERFACE OF GSU AFTER CONNECTING THE ENGINE

*when the engine is not started, the gsu displays rpm, temp, etc. after the engine is started, the data displayed by the gsu is real-time measured data.*

GSU SCREEN DISPLAY：
RPM：
TEMP：
CURRY：
PRE：
PWRVOL：
PEVVOL：　ENGINE MODEL
TIME：　ACC：
STATE：
COLUMN CHART (RPM,TEMP,PUMP,RC)


*note:*

① *acc represents the acceleration time from idle to 100% maximum speed, measured in seconds;*

② *the oil pump value is the output voltage multiplied by 1000. for example, if the maximum speed output is 4.0v, it will display 4000;*

③ *the temperature unit can be switched between celsius or fahrenheit and has calibration function;*

### 5.7.2 ECU SETTING INTERFACE

*press the ok button to enter the settings directory. the data in the upper part of the display screen is the last run record, and the settings interface is below. it is divided into nine parts: engine start-up, engine operation, remote calibration, starter motor, engine cooling, other settings, test settings, data charts, language settings, etc. press the "+" and "-" buttons to manually select from nine options.*

GSU SCREEN ISPLAY：
RUN INFORMATION
TOTAL TIME：
CYCLE：
STOPRPM：
STOPTEMP:
MAXRPM：
SETTING
STARTUP, RUNNING,STUDY RC,
STARTER,COOLING,OTHER,TEST,


### 5.7.3 ENGINE STARTUP SETTINGS

*when the engine startup option is selected, press the ok key to enter the startup parameter setting interface. press the plus sign "+" and minus sign "-" to select various parameter options, press the ok key to select the option, and then press the plus sign "+" and minus sign "-" to set the size and value of the parameters. the meaning represented by each parameter is as follows:*

- *pump voltage: the driving voltage of the oil pump during ignition. if the oil pump cannot rotate smoothly or waits for too long to rotate during each ignition, increase this value. control the oil output during startup, the higher the voltage, the more oil is supplied during startup.*
- *rpm startup ramp: refers to the slope of the increase in starting motor speed during the period from ignition to clutch disengagement. the higher the slope, the faster the speed increase.*

➢ *pump startup ramp : adjust the fuel supply slope between clutch disengagement and idle speed; it refers to the fuel supply slope of the oil pump during the engine start-up phase. the higher the slope value, the greater the fuel supply.*

➢ *glow plug: the voltage value supplied to the ignition head during engine ignition generally does not exceed 7v. when the weather is cold or the ignition only emits smoke without igniting, it is because the temperature of the ignition head is not high enough. you can try to slightly adjust it by 0.2v each time, and the maximum cannot exceed 7v. adjusting it arbitrarily can easily cause overheating and shorten the life of the ignition head;*

➢*valve: when the engine is ignited, it controls the amount of oil in the ignition oil circuit. the higher the oil threshold, the longer the opening time, and the more fuel is supplied.*

➢*ignition RPM: when the ignition speed is reached, the engine starts to ignite, the hot head lights up, and the ignition program enters.*

➢*prehea trpm: when the engine reaches the preheating temperature, the engine speed increases to the preheating speed and enters the preheating program.*

➢*rpm off starter: when the specified disengagement speed is reached, the starter motor clutch will disengage from the spindle clutch. speed: when the specified disengagement speed is reached, the starter motor clutch will disengage from the spindle.*

GSU SCREEN
PUMP VOLTAGE：
RPM STARTUP RAMP:
PUMP STARTUP RAMP
GLOW PLUG
VALVE:
IGNITION RPM:
PREHEA tRPM:
RPM OFF STARTER:

### 5.7.4 ENGINE OPERATING PARAMETER SETTING INTERFACE

*press the c key from the previous interface to exit and enter the settings directory interface. press the plus "+" and minus "-" keys to select the engine running and enter the engine running parameter setting interface below. press the plus sign "+" and minus sign "-" to select various parameter options, press the ok key to select the option, and then press the plus sign "+" and minus sign "-" to set the size and value of the parameters. the meaning represented by each parameter is as follows:*

- *rpm acc: the higher the acceleration value, the faster the fuel supply slope and the faster the acceleration time.*
- *rpm dec: the higher the deceleration value, the faster the oil collection slope and the faster the oil collection time.*
- *max rpm: the maximum rpm value reached by the engine setting.*
- *idle rpm: the standby speed value set by the engine.*
- *min rpm: below the minimum speed, the ecu defaults to engine shutdown.*
- *max temp: temperature protection value. when the temperature exceeds the maximum temperature, flameout protection will be implemented.*
- low colt: when the voltage falls below the minimum value, the engine will issue a low voltage alarm.
- *restart glow plug: the ignition voltage during automatic startup.*
- *puml imit: after reaching the specified limit value, the oil pump value will not increase.*

GSU SCREEN DISPLAY：
ENGINE RUNNING
RPM ACC:
RPM DEC:
MAX RPM:
IDLE RPM:
MIN RPM:
MAX TEMP:
LOW COLT:
RESTART GLOW PLUG:
PUML IMIT:

## 5.7.5 REMOTE CONTROL OPERATION CALIBRATION LEARNING INTERFACE

*press the c key from the previous interface to exit and enter the settings directory interface. press the plus "+" and minus "-" keys to select the calibration remote control and enter the remote control operation calibration learning parameter setting interface below. press the plus sign "+" and minus sign "-" to select various parameter options, press the ok key to select the option, and then press the plus sign "+" and minus sign "-" to set the size and value of the parameters. the meaning represented by each parameter is as follows.*

- *set the throttle stroke from this menu, and futaba's remote control must set the throttle channel to reverse phase;*
- *max: indicates the highest throttle, maximum throttle, highest fine adjustment*
- *failsatetime: for the out of control protection time, 1.0 represents 1 second*
- *protocol：The factory setting is ZK. If you have any special requirements, please contact swiwin after-sales personnel*
- *uart-band rate：The factory setting is 9600, which can be adjusted according to customer requirements*
- *uart-stop bit：The factory setting is 2, which can be adjusted according to customer requirements*

GSU THE SCREEN WILL DISPLAY：
RC STUDY
MAX：
IDLE：
FAILSATETIME：
PROTOCOL：
UART-BAND RATE：
UART-STOP BIT：

### 5.7.6 STARTING MOTOR PARAMETER SETTING INTERFACE

➢*eject time: control the time for the starter motor to pop up the clutch*

➢*eject voltage: the voltage value when the clutch is disengaged.*

➢*run voltage: the voltage value at which the motor operates normally during the start-up phase.*

➢*rpm stable: when starting, the speed will not have a significant up and down fluctuation stabilizing effect.*

GSU THE SCREEN WILL DISPLAY：
START
EJECT TIME:
EJECT VOLTAGE:
RUN VOLTAGE:
RPM STABLE:


### 5.7.7 ENGINE COOLING PARAMETER SETTING INTERFACE

*press the c key to exit from the previous interface and enter the settings directory interface. press the plus "+" and minus "-" keys to select engine cooling and enter the engine cooling parameter settings interface below.*

*rpm: after the engine is turned off normally, the starter motor will run to cool the engine until it reaches room temperature. the rotational speed refers to the operating speed of the starting motor during cooling.*

GSU THE SCREEN WILL DISPLAY：
RPM：

*remarks:*

*①set the cooling speed after normal shutdown, and stop cooling when the engine automatically cools down to 80 ℃ after normal shutdown. cooling is the continuous operation of the starter motor, as the ecu cannot determine whether there is a fire condition in case of accidental shutdown. therefore, if the shutdown is not normal, it will not automatically cool down;*

*②when the engine unexpectedly stalls, it is also necessary to cool down as quickly as possible to protect the engine. at this time, manual cooling can be used by placing the fine adjustment at the lowest position and pushing the throttle to the highest position to perform manual cooling;*

*③if the temperature is above 80 ℃ during startup, it will also be cooled first until the temperature drops below 80 ℃ before starting;*

**5.7.8 OTHER PARAMETER SETTING INTERFACE**

*press the c key to exit from the previous interface and enter the settings directory interface. press the plus sign "+" and minus sign "-" keys to select other parameters and enter the other parameter settings interface below. press the plus sign "+" and minus sign "-" to select various parameter options, press the ok key to select the option, and then press the plus sign "+" and minus sign "-" to set the size and value of the parameters.*

*the meaning represented by each parameter is as follows:*

- *clearbatused : after the test is completed, reset all the battery used in the ecu to zero (for recording purposes)*
- *adjust temp: adjust according to the environment.*
- *pump type: adjust according to the oil pump used.*
- *software version: latest*

GSU THE SCREEN WILL DISPLAY：
CLEARBATUSED：
ADJUSTTEMP：
TEMPERATURE UNIT：
TEMPTYPE：
ECU-VER VERSION：
GSU - VER：


### 5.7.9 TEST PARAMETER SETTING INTERFACE

*press the c key to exit from the previous interface, enter the settings directory interface, select the test by pressing the plus "+" and minus "-" keys, and enter the test parameter settings interface below. press the plus sign "+" and minus sign "-" to select from various parameter options, and press the ok key to select the option. the testing function is to test whether certain hardware can work properly.*

GSU THE SCREEN WILL DISPLAY：
TEST ENGINE
TEST FUEL PUMP
TEST  IGNITI PUMP
TEST FUEL VALUE
TEST GAS VALUE
TEST GLOWPLUG
TEST STARTER

### 5.7.10 DATA CHART DISPLAY INTERFACE

*data chart: record the status of engine start-up and operation. different colored curves represent different meanings. green represents speed, red represents temperature, light blue represents oil pump, and blue represents voltage.*

GSU THE SCREEN WILL DISPLAY：
DATA CHART (CURVE CHART AREA)
RPM (GREEN TEXT)：
TEMPE(RED TEXT)：
PUMP (LIGHT BLUE)：
COOLING (WHITE TEXT)：
PWRVOL (DARK BLUE TEXT)：
RC (YELLOW TEXT)：


### 5.7.11 SET LANGUAGE INTERFACE

*by selecting, the monitor can be set to different languages such as english, 中文（简体）, 中文（繁体） and espanol.*

GSU THE SCREEN WILL DISPLAY：
SET LANGUAGE
ENGLISH
中文（简体）
中文（繁体）
ESPANOL
RESET CONFIG

### 5.7.12 TEMPERATURE CORRECTION

*during the engine start-up process, the ecu controls the engine operation by judging the built-in temperature sensor. if the temperature sensor inside the engine differs significantly from the ambient temperature, it will affect the ecu's judgment and require the use of gsu for temperature calibration of the engine.*

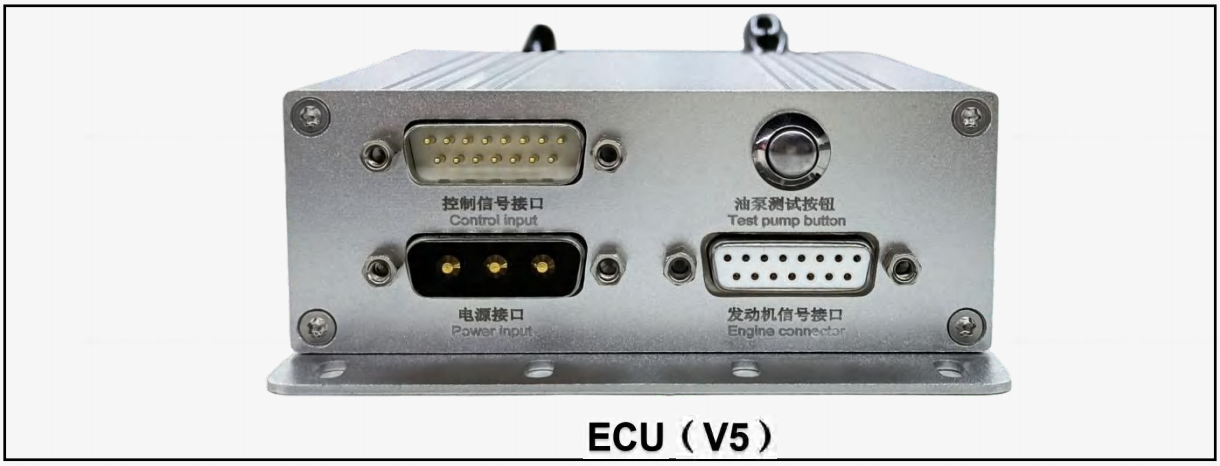
on the gsu main interface,select"other"


select 'ad just temp' and click '+-' to adjust the temperature up and down, keeping the corrected temperature consistent with the ambient temperature.

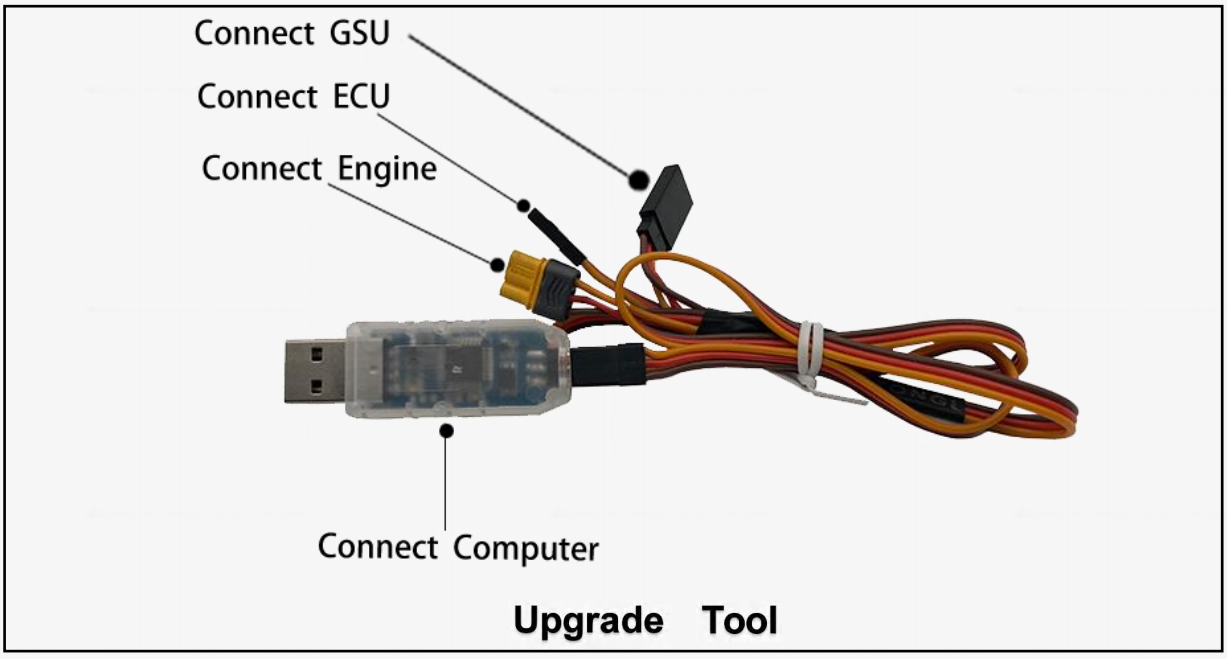
## 5.8 ECU (V5) INSTRUCTIONS FOR USE

### 5.8.1 HARDWARE PREPARATION

Serial Tools

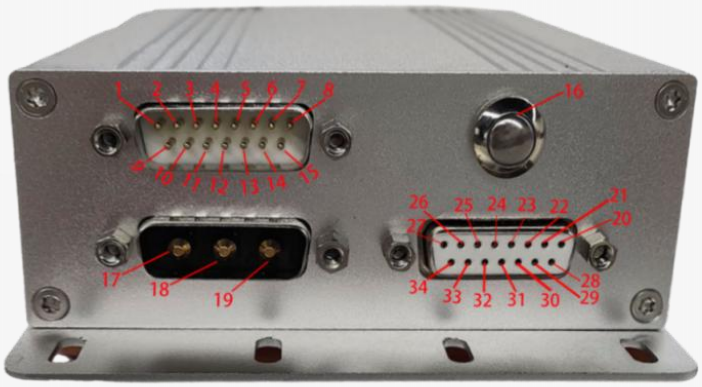



ECU（V5）




Upgrade Tool

## 5.8.2 ECU(V5) DETAILED INTRODUCTION




*pin 1-15 is an rs232/rs422 interface, used to connect external signal control devices and can be connected to rs232 or rs422 interfaces*

*WHEN CONNECTING TO RS232 INTERFACE：*

*Pin 1：reserved port*

*Pin 2：gsu data port*

*Pin 3：gsu positive pole of power supply*

*Pin 4：gsu negative pole or ground wire of power supply*

*Pin 5-8：reserved port*

*Pin 9：ppm throttle*

*Pin 10：ppm switch*

*Pin 11：ppm positive pole of power supply*

*Pin 12：ppm negative pole of power supply*

*Pin 13：rx port of rs232*

*Pin 14：tx port of rs232*

*Pin 15：rs232 ground wire*

*note: the rs232 signal cable supports both 232 serial port control and ppm control.*

*WHEN CONNECTING TO RS422 INTERFACE：*

*Pin 1：reserved port*

*Pin 2：gsu data port*

*Pin 3：gsu positive pole of power supply*

*Pin 4：gsu negative pole of power supply or ground level*

*Pin 5：rs422 t+mouth*

*Pin 6：rs422 t-mouth*

*Pin 7：rs422 r+mouth*

*Pin 8：rs422 r-mouth*

*Pin 9-15：reserved port*

*OIL PUMP BUTTON:*

*number 16：oil pump button, used to control the oil output of the oil pump*

*POWER INTERFACE:*

*connect the power interface to a 20-32v power supply*

*Number 17：reserved, the first reserved port*

*Number 18：positive pole, positive pole of power supply*

*Number 19：negative pole, power supply negative pole*

*SIGNAL INTERFACE:*

*used for connecting with the engine signal plug*

*Pin 20-22：interface for starting motor b*

*Pin 23-25：interface for starting motor a*

*Pin 26：negative pole of temperature sensor*

*Pin 27：positive pole of temperature sensor*

*Pin 28-30：interface for starting motor c*

*Pin 31-32：fire head ground wire interface*

*Pin 33：interface of huotou 2*

*Pin 34：interface of fire head 1*


*OIL INLET*

*number 35:oil inlet, connected to the fuel tank*

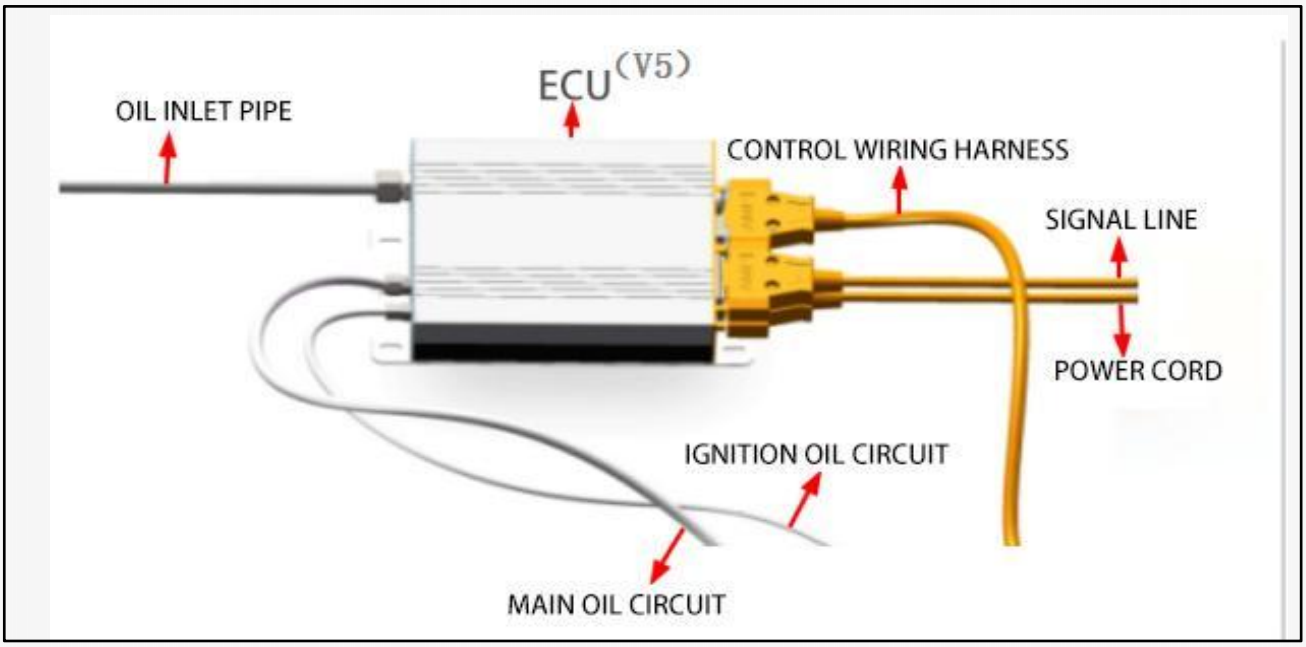
*OIL OUTLET*

*number 36:oil outlet, responsible for supplying oil to the main oil circuit of the engine*

*number 37:oil outlet, responsible for supplying oil to the engine ignition oil circuit*

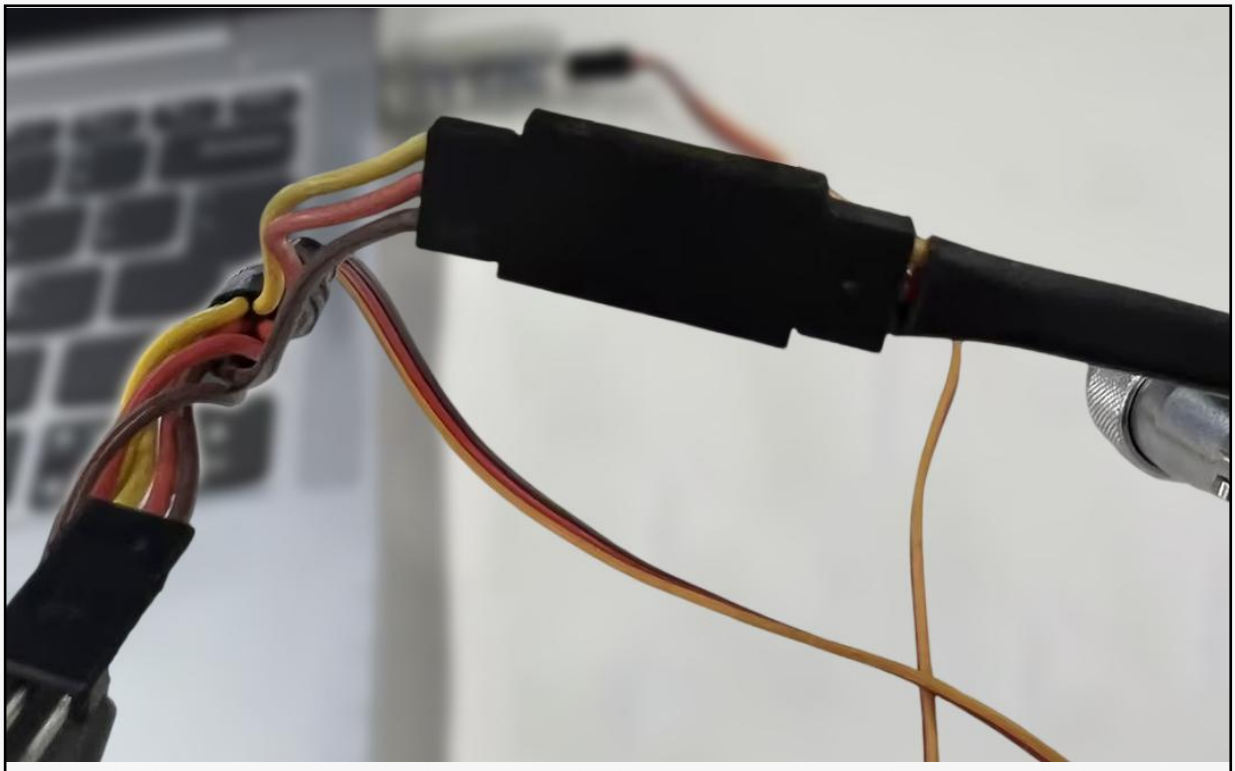
### 5.8.3 CONNECT

### 1. ECU (V5) CONNECTION DIAGRAM

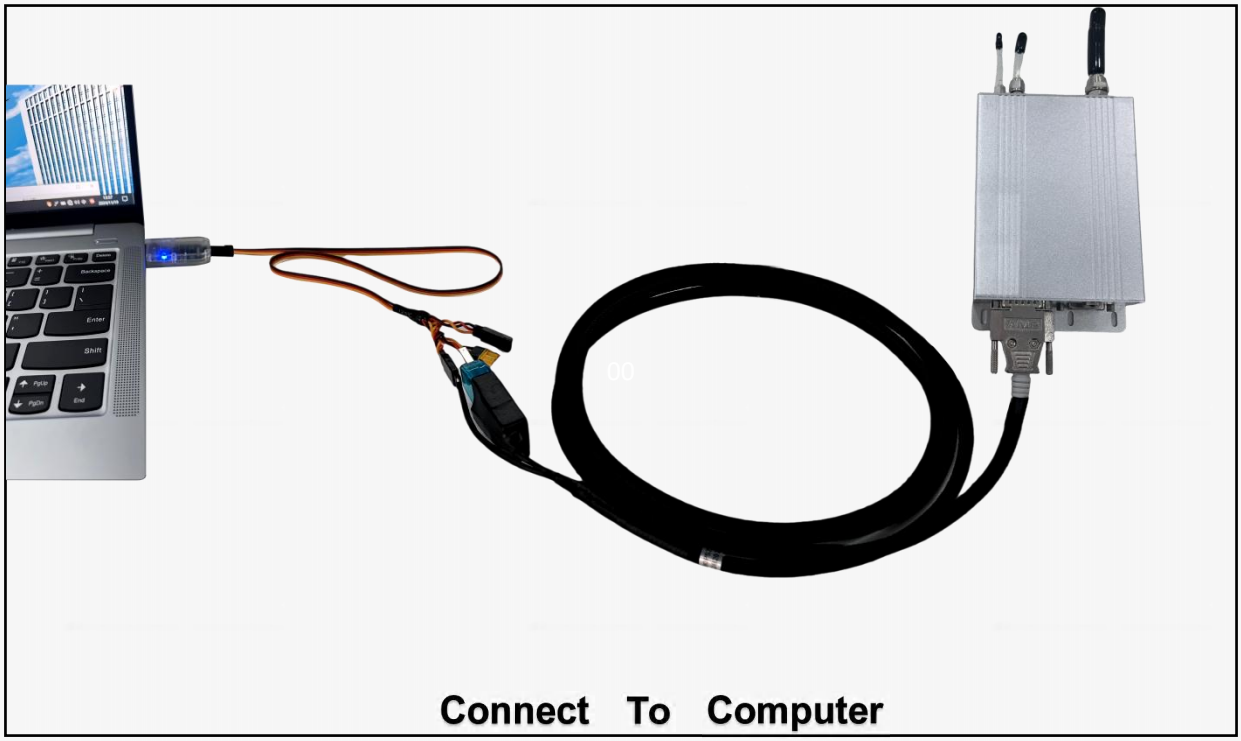



### 2.CONNECT ECU (V5), SERIAL TOOL, UPGRADE TOOL, AND COMPUTER

Upgrade Tool Connect Serial Tool

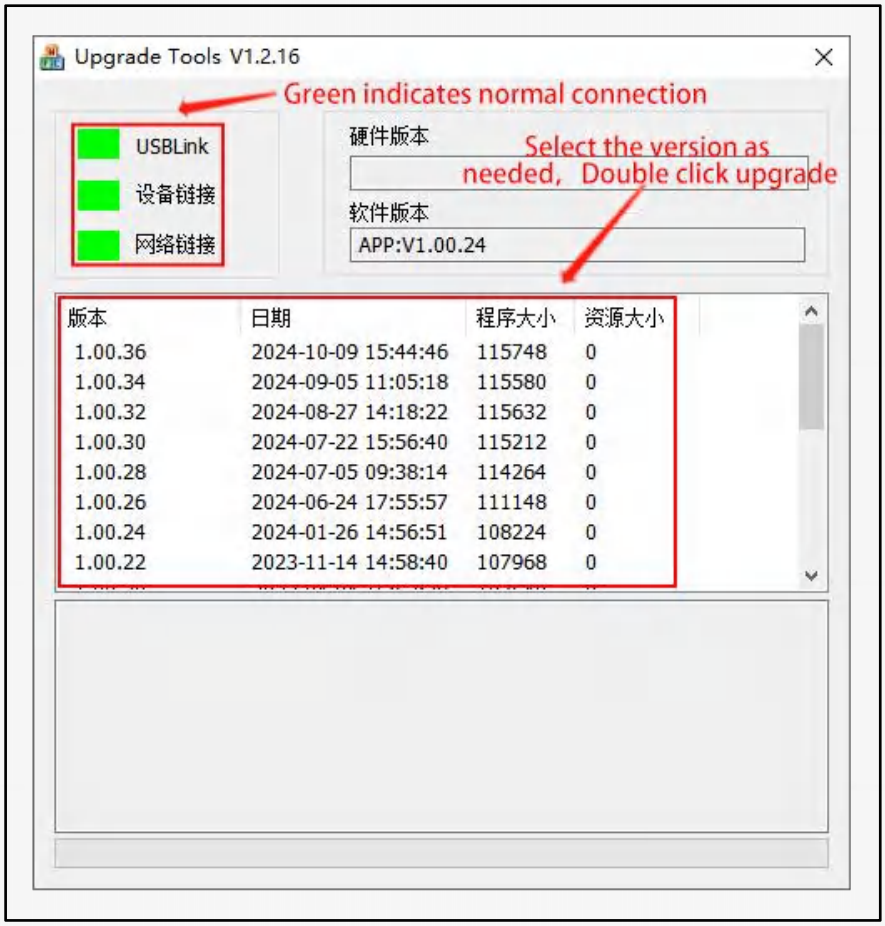


Upgrade Tool Connect Serial Tool



Connect To Computer

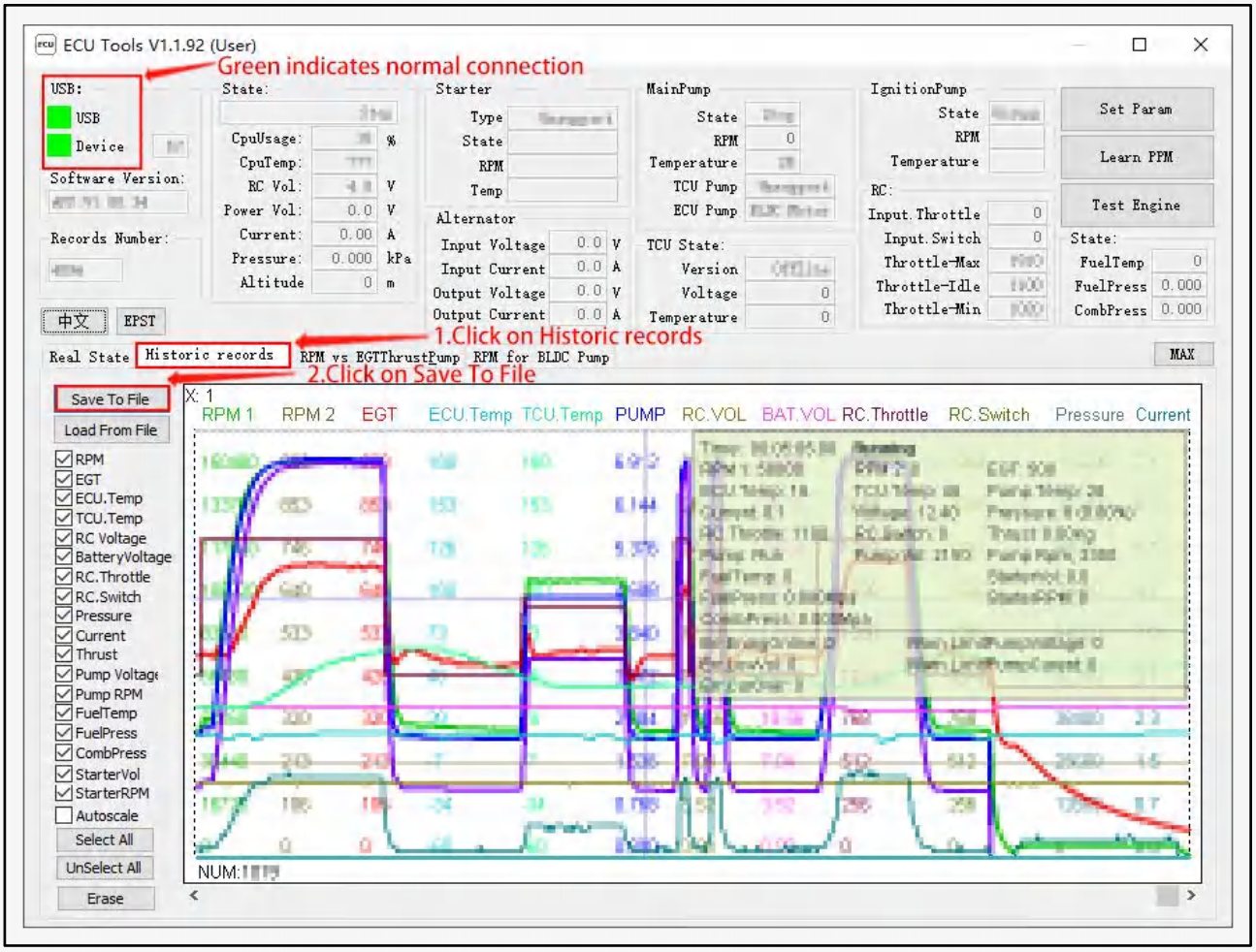
### 5.8.4 SOFTWARE UPGRADE




*1. after preparing the hardware, use the included usb flash drive or log in to the official website of swiwin power http://www.swiwin.com download upgrade tools.*

*2. open upgrade tools to upgrade the software, double-click to select the corresponding software version, and wait for the upgrade to complete.*

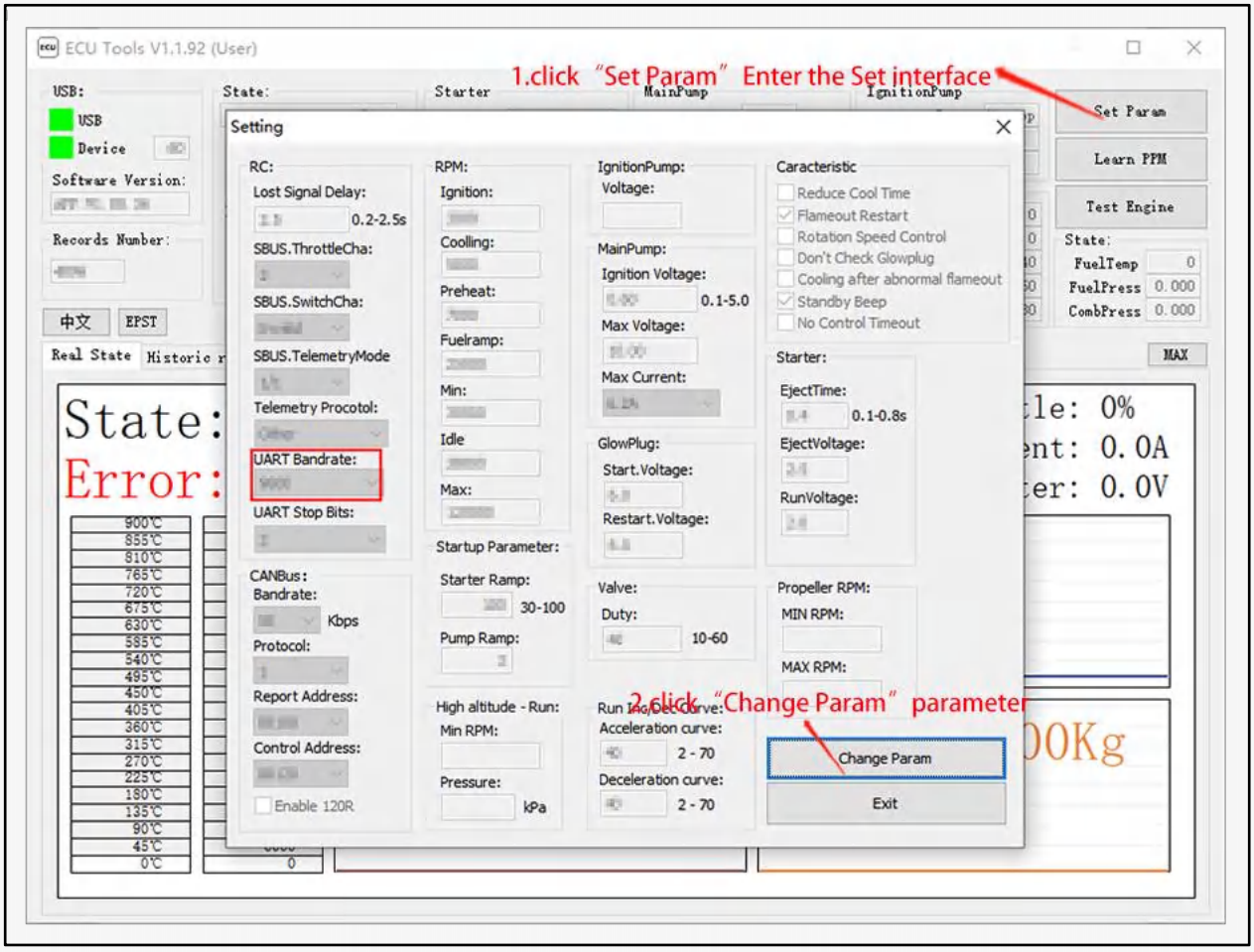
## 5.8.5 DATA DOWNLOAD




*1. after preparing the hardware, use the included usb flash drive or log in to the official website of swiwin power http://www.swiwin.com download ecu tools.*

*2. open the ecu tools software, click on "historic records " and wait for the data to load, then click on "save to file" to complete.*

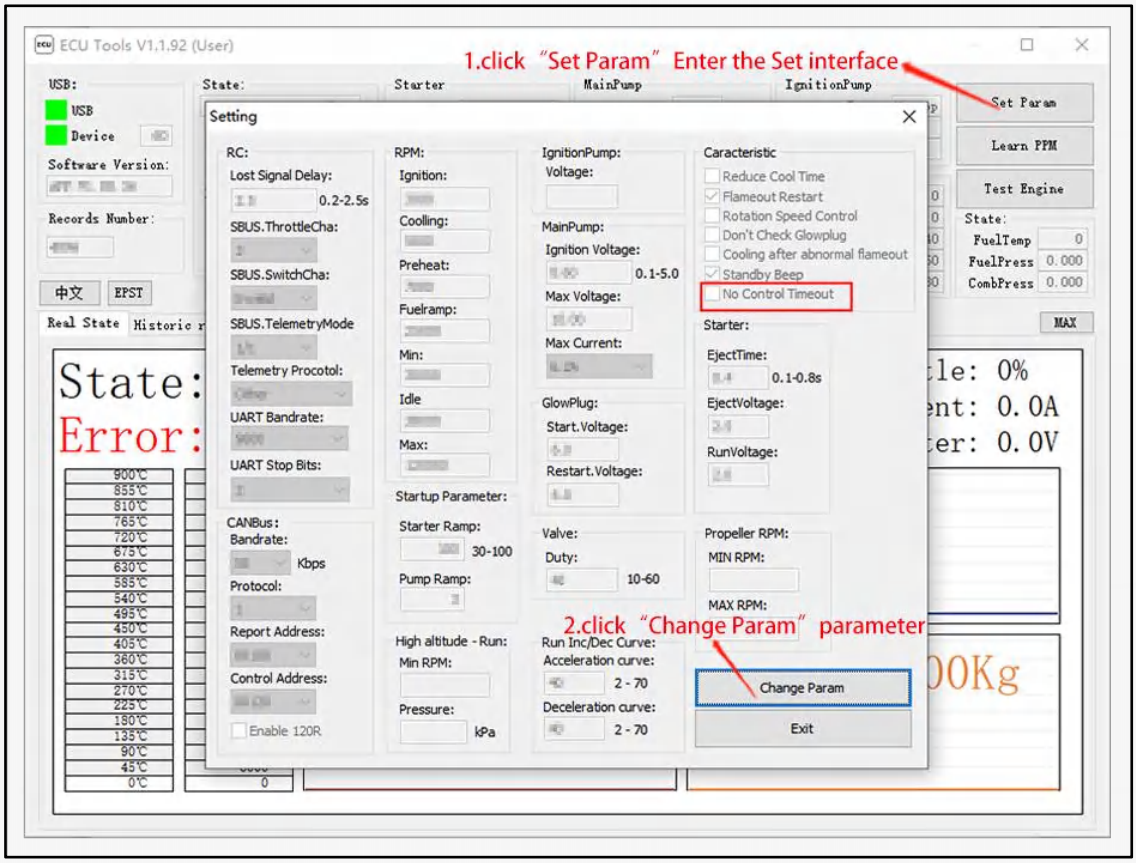
## 5.8.6 MODIFY BAUD RATE/CHANGE SETTING PARAMETERS




*1.after preparing the hardware, use the included usb flash drive or log in to the official website of swiwin power http://www.swiwin.com download ecu tools.*

*2.open the ecutools software, click "set param" to open the settings interface, and click "change param" to modify the settings and parameters.*

## 5.8.7 CANCEL REMOTE CONTROL SIGNAL LOSS MONITORING




*1.open the ecu tools（user）software, click on "set param", in the "characteristic parameters" column, check "no control timeout". attention: after selecting "no control timeout", the ecu will continue to execute the last command of the engine after receiving the signal interruption. if "no control timeout" is not selected, the engine will stop directly after 2.5 seconds of signal interruption and immediately enter the cooling state.*

*2.you can also use the same method to change "acceleration cooling", "shutdown restart", "speed closed-loop control", etc.*

***note: at the factory, all parameters and characteristic parameters of the engine have been set according to the engine performance and customer requirements. please make sure to communicate with swiwin after-sales personnel before making any changes.***

# 6. ENGINE DEBUGGING

## 6.1 ENGINE ASSEMBLY

*the sw800pro engine is a precision instrument composed of high-precision components. each new machine undergoes strict dynamic balancing, bare machine testing, and whole machine testing before leaving the factory, and the test results are recorded. the test results of the entire machine will be shipped together with the engine in the form of an "engine operation sheet".*

## 6.2 ENGINE TEST RUN

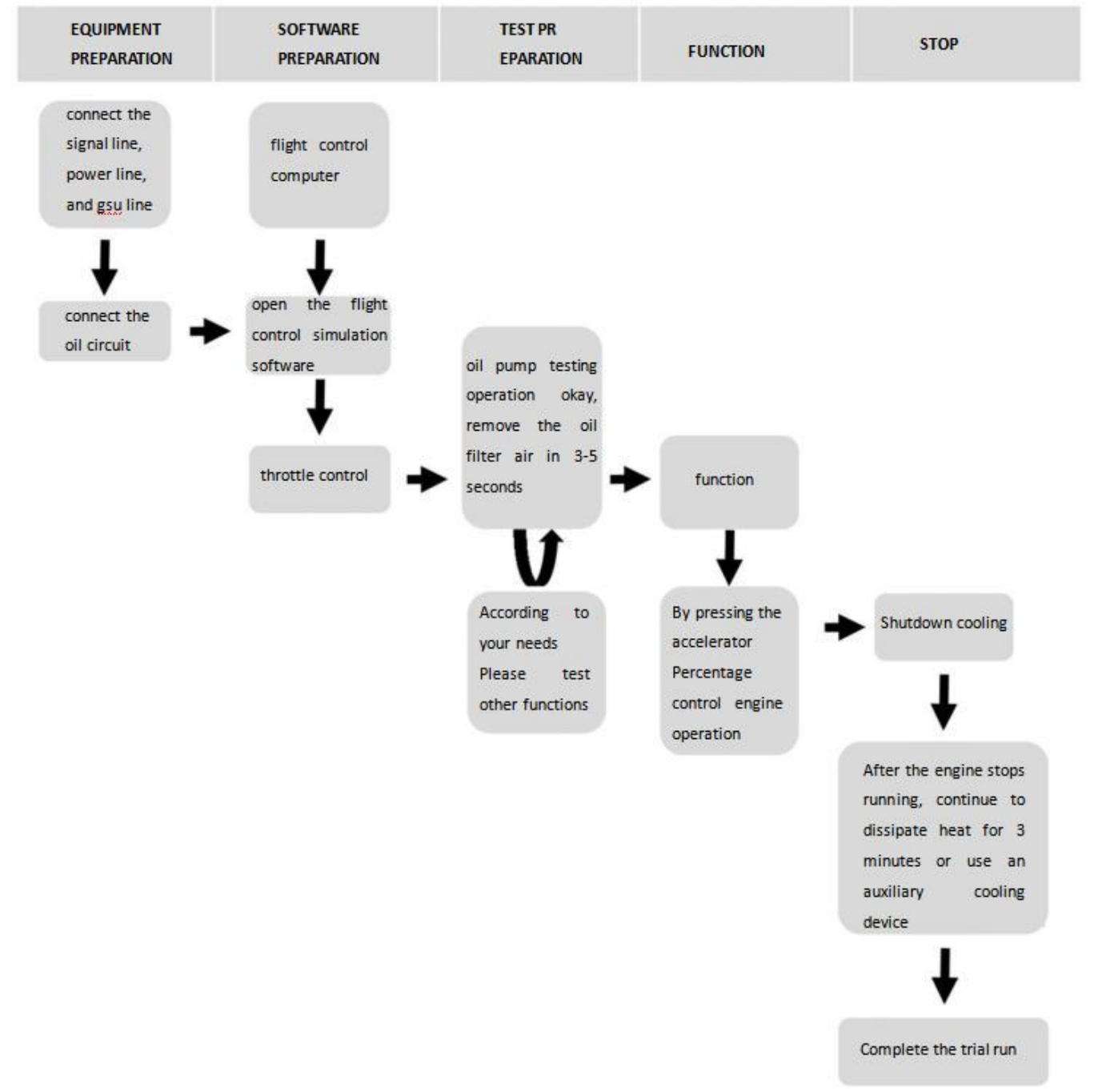
### 6.2.1 REQUIREMENTS FOR VENUE AND FACILITIES

*you need to meet the following conditions to conduct engine testing:*

*1) equipped with a fixed 80kg thrust engine fixture, the engine is securely fixed.*

*2) a well-equipped testing space, or an open outdoor space, where there should be no vegetation cover, foreign objects, debris, or large dust in the hazardous area during engine operation.*

## 6.2.2 BRIEF FLOWCHART OF GROUND TESTING



## 6.3 ENGINE INSTALLATION

*the external dimensions and installation of the engine are detailed in the engine dimension diagram.*

*please note that the overall dimensions do not include external engine parts. before installation, sufficient allowance should be left and operated carefully to ensure that the external temperature sensor (temperature sensing sensor) is not damaged.*

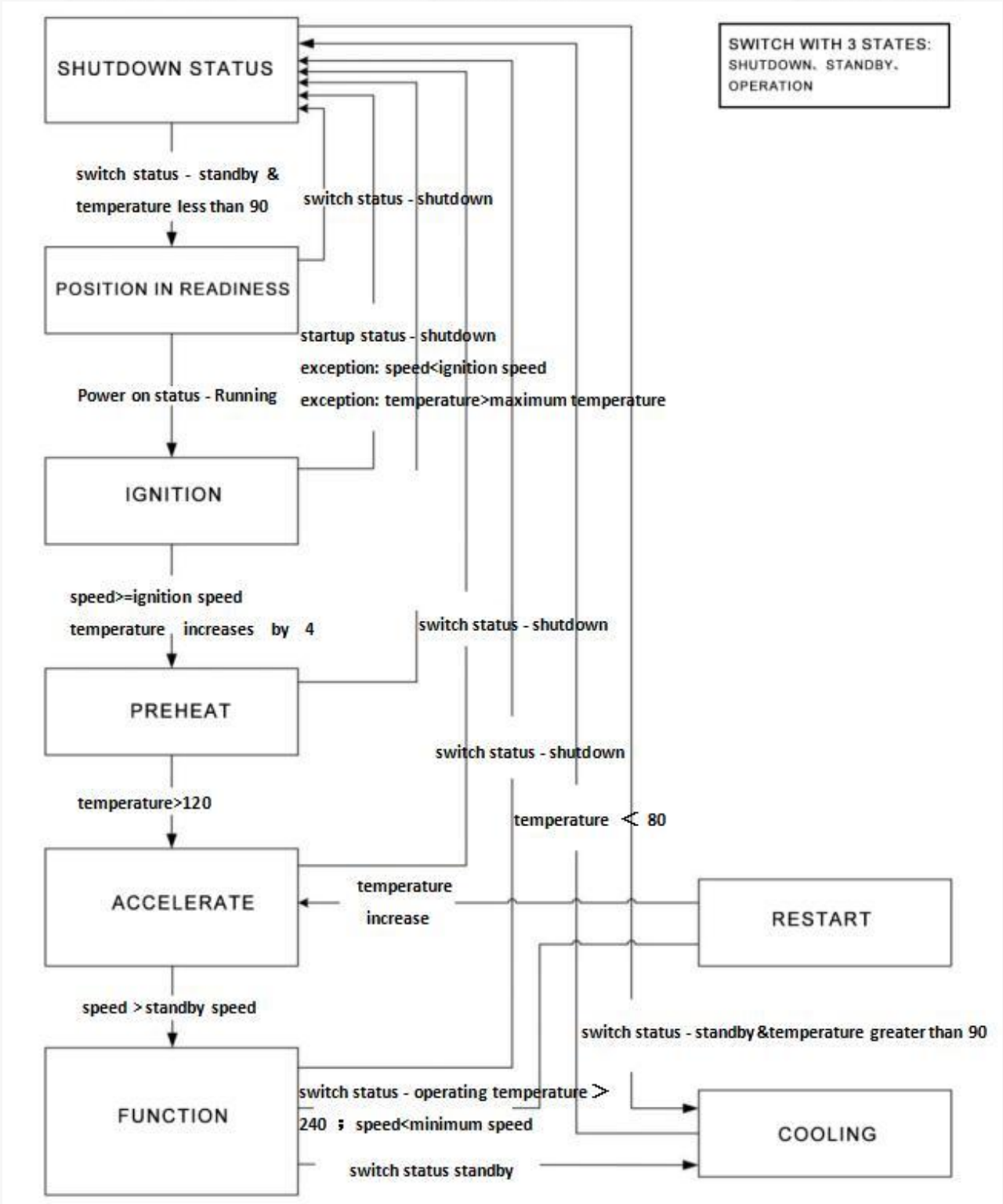
## 6.4 PRE STARTUP TESTING

*after the engine installation is completed and all wiring harnesses are connected, use the display to test the main oil pump and exhaust the air inside the oil pipe on the testing function interface. press and hold the ignition solenoid valve again to test the ignition. at this point, the ignition oil pump starts for about 3 seconds. if you hear a significant decrease in the speed of the ignition oil pump (due to the ultrasonic resistance of the fuel to the oil pump gear), it is judged that the ignition oil pump is in its optimal operating state. test the starter motor (rotating the impeller clockwise), test the ignition head (two red dots visible from the tail nozzle inward), and test the solenoid valve (audible clattering sound). if the tested components are working properly, the startup test can be carried out.*

## 6.5 SAFETY

*the testing site and equipment meet the requirements, pay attention to personnel safety, and start the test (see safety instructions for details).*

## 6.6 ENGINE OPERATION PROCESS DIAGRAM



# 7.PARAMETERS RELATED TO ENGINE STARTUP AND OPERATION

*the following are the parameters related to engine start-up, which have been set at the time of the engine leaving the factory. you can refer to these data when using the product.*

| | |
|---|---|
| supply voltage<br>ignition voltage<br>motor slope | 20v<br>3.6v<br>100 |
| pump start up ramp | 2 |
| glow plug | 5-7.6v |
| duty cycle of solenoid valve | 40 |
| ignition rpm | 1300rpm |
| preheat rpm | 2000rpm |
| rpm off starter | 13000rpm |
| pop-up time | 0.8s |
| ejection voltage | 5v |
| run voltage | 2.5v |
| rpm stable | 20 |
| rpm acc | 10 |
| rpm dec | 10 |
| max rpm | 65000 |
| idle rpm | 25000 |
| minimum speed | 15000 |
| max temp | 1000℃ |
| low volt | 10v |
| restart | close |
| restart glow plug | consistent with the voltage of the burner |
| pump limit | 28v |
| idle stable | 8 |

***note: all parameters of the engine have been set before leaving the factory, please do not change them arbitrarily. if you have any special needs or questions, please contact swiwin after-sales service personnel.***

# 8.FREQUENTLY ASKED QUESTIONS

## 8.1COMMON PROBLEM ELIMINATION

| problem description | cause analysis | exclusion measures |
|---|---|---|
| startup failed | 1. check the voltage setting of the oil pump and observe whether the working status of the oil pump body is stuck. check the oil discharge status. check the oil output. adjust the oil pump voltage. 2. check the ignition head and whether the voltage setting is correct. test the ignition head to see if it lights up. 3. test the solenoid valve to see if it is working properly. 4. check if the oil circuit is blocked. 5. check if the ecu parameters are read correctly. 6. check if the oil filter in the oil circuit is blocked. 7. check if the tcu is intact. 8. check if the speed is abnormal. 9. check if the ground wire is connected correctly. 10. check if the screw connection is tight. 11. check if the software is of the appropriate version number. | check whether each oil circuit, pipeline, and wiring is connected correctly and completely. is the battery running low. parameter reset, replace starter assembly, replace ignition head, replace solenoid valve assembly, and tighten screws again. |
| the ignition head has no current or does not light up | 1. check if there is current in the test ignition head of the test project. 2. check if the ignition head lights up when the tail nozzle is out. 3. disassemble the machine and check if the ignition head is broken. 4. check if the insulation tube of the ignition head is broken. 5. check if the ground wire of the ignition head is connected and non-conductive. 6. replace with a new ignition head 7. replace with a new tcu 8. re import parameters | check whether each oil circuit, pipeline, and wiring is connected correctly and completely. replace the ignition head, replace the insulation tube, and upgrade the software again. is the battery running low. |
| starter malfunction | 1. check if there is a burnt smell on the starter motor or if it rotates smoothly by hand. 2. check if the parameters of the starter motor are correct or adjust them. 3. check if the rubber ring of the clutch is abnormal or replace it. 4. check the wear status of the clutch and replace it immediately if it is severely worn. 5. check | check whether each oil circuit, pipeline, and wiring is connected correctly and completely. is the battery running low. replace the starter assembly, clutch, and parameters. |

| | | |
|---|---|---|
| | the software version. 6. check if the tcu parameters are correct. | |
| long startup time | 1. check if the oil pump is smooth or stuck. 2. check the ignition temperature and ignition confirmation temperature. 3. check if the heating time is 7 seconds. 4. check if the oil circuit is smooth. 5. check if the solenoid valve works smoothly. 6. check if the temperature rises and if it increases. 7. check if the connections of each circuit are correct. | check if there is fuel in the fuel pipe and if the fuel pump is working. replace the oil pump, replace the ignition head, replace the solenoid valve, and replace the temperature sensing probe. is the battery running low. |
| engine starts and sprays a large flame | 1. check if the parameter settings of the solenoid valve and oil pump are correct. 2. check if the oil pump matches the engine. 3. check if the oil circuit is connected incorrectly. 4. check the solenoid valve gasket | replace the oil pump, check the parameters, reconnect the oil circuit, or replace the solenoid valve. reduce the voltage of the oil pump. |
| the temperature does not rise when the engine is ignited | 1. check if the temperature probe is damaged. 2. check if the oil circuit is flowing smoothly. 3. check if the temperature probe is connected incorrectly. 4. check if the battery is running low. | replace the temperature sensing probe and reconnect it. reduce the voltage of the oil pump. replace the oil pump. |
| unable to reach full speed | 1. engine oil leakage 2. incorrect use of oil pump 3. current limitation 4. oil pump power limitation 5. whether the oil circuit is blocked | increase oil pump parameters, replace oil pump, check for oil leakage. replace oil circuit or solenoid valve, replace oil pump and pipeline. |
| slow acceleration time | 1. insufficient combustion in the combustion chamber 2. defects in the nozzle ring 3. unsmooth oil circuit 4. stuck oil pump 5. low acceleration curve | replace the combustion chamber, replace the nozzle ring, change the acceleration curve value, and replace the oil pump. |
| power overload | 1. circuit board failure 2. welding harness short circuit 3. the spindle and starter motor are not concentric 4. the harness is damaged 5. the front outer cover is deformed | check each circuit and replace the battery. |
| engine vibration | 1. check if the connections of each component are tight. 2. check if the engine balance is within the process requirements. 3. check if the screws of the compressor wheel and rear turbine are tight. 4. check if | replace the bearings, replace the compressor and rear turbine, replace the shaft tube, tighten all screws and components |

| | | |
|---|---|---|
| | the bearings are damaged. 5. check if the compressor wheel and rear turbine are cracked or chipped. 6. check if there are any foreign objects in the shaft tube | |
| engine stalling | 1. is the nozzle ring abnormal? 2. is the oil pump stuck? 3. is the solenoid valve not open and holding? 4. tcu fault. 5. blockage in the oil circuit. 6. no oil in the fuel tank. 7. unstable voltage. 8. short circuit in the power supply. 9. engine suction of foreign objects. 10. engine affected by airflow | replace the nozzle ring, replace the oil pump, replace the tcu, and replace the power supply. spin the nozzle ring. |
| engine chip loss | 1. compressor blade falling off 2. rear turbine blade falling off 3. foreign objects entering the engine intake 4. high temperature 5. speed exceeding the specified speed 6. loose screws 7. nozzle ring falling off 8. oil needle or internal engine screws falling off and hitting the blades 9. material defects inside, such as sand holes, cracks, fractures, air holes, etc. | replace the compressor or replace the rear turbine |
| acceleration anomaly | check if it is normal for the clutch to reach the disengagement speed after starting the engine | reduce the speed slope or increase the slope of the oil pump. check the battery voltage. |
| engine entering the soil | check the engine body. check the bearings of the compressor and expander. | disassemble the engine, replace the oil needle, replace the solenoid valve assembly, replace damaged components such as bearings. clean up the soil residue inside again. rebalance the test machine. |
| cannot ignite, temperature does not rise | check if the ignition head of the engine is abnormal, check if the temperature sensing probe is working properly, clean the ignition oil circuit, and check if the oil delivery is smooth. | clean the oil circuit and test the temperature sensing characteristics of the temperature sensing probe. installation testing. |
| gsu shows engine not found | check the version of gsu and replace it for testing. check the connection status of the circuit, check if the wiring harness is normal, and check if the ecu is normal. | gsu upgrade, repair ecu circuit board, remove capacitors. test the engine again. |
| engine idling and stalling | check if the engine oil pump is stuck, check if the tcu and speed are abnormal, and | replace tcu, replace oil pump |

| | | |
|---|---|---|
| | check if the oil circuit is smooth. | |
| engine water ingress | check each component, such as bearings, shaft tubes, compressor wheels, and inspect tcu and ecu | replace bearings, shaft tubes, compressor wheels, replace tcu ,ecu |
| cannot start normally, cannot preheat after startup | check the starter motor, clutch, spindle, and the wiring harness of the motor for normal operation | replace the starter assembly and retest the engine |
| shell deformation, tail nozzle deformation | check the operation records of the ecu and verify if there are any abnormalities in the rear turbine of the compressor. check if the screw holes at the connection position of the shell are abnormal, and check if the screw holes at the connection of the tailpipe are abnormal | replace the casing, replace the tailpipe, and replace any abnormal screw hole components. |
| when starting, the display has current but cannot ignite | 1. check if the spindle is rotating. 2. check if each wire harness is short circuited. 3. check if the battery is leaking | repair the starter motor or spindle, repair various circuits or replace the battery. |

## 8.2 ECU ERROR FAULT ANALYSIS

*during the operation of the engine, if there is a signal malfunction, the ecu will automatically report an error. the following table explains these faults.*

| error name | explain |
|---|---|
| overtime | 1. during ignition: temperature remains unchanged for 20 seconds<br>2. forced cooling: time exceeding 60 seconds |
| low battery voltage | 1. the voltage of the power battery is lower than the minimum value (the minimum value can be modified)<br>2. the voltage of the remote control receiver is lower than 4v |
| fire head malfunction | 1. no flame current detected |
| abnormal oil pump | 1. unable to connect to the oil pump motor controller (only supported by brushless motor version) |
| starting motor malfunction | 1. during ignition: the engine speed cannot reach the ignition speed |
| low rotational speed | 1. during ignition: the engine speed drops to 50% of the ignition speed<br>2. during preheating: the engine speed drops below the ignition speed<br>3. during acceleration: the engine speed drops below the warm-up speed<br>4. during operation: the engine speed is lower than the set minimum speed |
| unstable rotational speed | 1. during acceleration: engine rpm fluctuates up and down<br>2. during acceleration: the engine speed drops significantly |
| high temperature | 1. during ignition: the exhaust temperature is greater than the set maximum temperature value<br>2. during preheating: the exhaust temperature is greater than the set maximum temperature value<br>3. during acceleration: the exhaust temperature is greater than the set maximum temperature value for 4 seconds |

# 9. COMPATIBILITY

*if using zk or flight control software to control the engine, the connection between the engine and your device involves compatibility issues.*

## 9.1COMPATIBILITY OF SERIAL PORT ADAPTER CABLE CONNECTORS

| NAME | PERFORMANCE INDEX | COMPATIBILITY |
|---|---|---|
| RS232 ADAPTER YHL-B232 | USB2.0,COMPATIBLE USB1.1<br>SUPPORT RS232 THREE WIRE SERIAL PORT INTERFACE<br>USB BUS FOR DIRECT POWER SUPPLY WITHOUT THE NEED FOR AN EXTERNAL POWER SOURCE<br>EQUIPPED WITH A SET OF 5V/500MA POWER OUTPUTS | SUPPORT COMPUTER SYSTEMS：WINDOWS2000、WINDOWSXP、WINDOWS SERVER 2003（32、64 位）/VISTA/WINDOWS 7（32、64 位）、WINDOWS 8、WINDOWS10 |

## 9.2 UPGRADER COMPATIBILITY

| NAME | PERFORMANCE INDEX | COMPATIBILITY |
|---|---|---|
| UPGRADER（ZK-LINK V1.4） | ----- | SUPPORT COMPUTER SYSTEMS：WINDOWS7、WINDOWS 8、WINDOWS10 |

# 10. STORAGE、LUBRICATION AND OIL TANK

## 10.1 STORAGE AND LUBRICATION

*1.all models of swiwin engines can use kerosene or diesel as fuel, and are mixed with 3% -5% lubricating oil. this mixed lubricating oil is also used in the bearing lubrication system, and it is recommended to use xuan yun brand or mobil pegasus no.2 lubricating oil.*

*2. excessive addition of lubricating oil can lead to a decrease in engine performance; insufficient addition of lubricating oil can lead to insufficient lubrication of bearings, resulting in malfunctions. mild cases may reduce engine life, while severe cases may lead to engine shutdown faults.*

*3. it is necessary to ensure that the mixed fuel is clean and free of impurities, and to keep the interior of the fuel tank clean and free of impurities.*

*4. unused engines should be stored in a cool, dry, and well ventilated place, and regularly tested to ensure that the engine is in normal condition. the engine has been stored for more than 3 months. to prevent bearing corrosion, it is recommended to lubricate the engine thoroughly with fuel, place it vertically, and seal it with a sealed bag. if there are ground testing conditions, ignition testing can provide better maintenance for the engine. if necessary, you can also contact after-sales personnel to return to the factory for maintenance.*

## 10.2 ENGINE OIL TANK

*1. micro turbojet engines use aviation kerosene or diesel, with the addition of specialized turbojet lubricating oil. the fuel tank material can be fiberglass or oil resistant plastic, and there are two types of fuel tank structures: hard fuel tanks and soft fuel tanks (depending on the situation).*

*2. in order to prevent air bubbles from entering the engine and causing engine shutdown faults, an anti bubble fuel tank must be equipped. the anti bubble fuel tank is placed between the main fuel tank and the oil pump. when refueling, the air in the anti bubble fuel tank should be emptied first before refueling.*

# 11. ENGINE MAINTENANCE AND UPKEEP

*0the maintenance requirements and cycle of the product, including cleaning, replacement of/ parts, etc.*

*1. maintenance plan: regularly inspect and replace lubricating oil, air filters, and other components of the engine.*

*2. daily maintenance: regularly check the fastening of various connecting parts and pipelines of the engine, and clean the surface of the engine.*

*3. troubleshooting: if encountering problems such as decreased engine performance or abnormal noise, follow the maintenance manual and troubleshooting process for operation.*

*to ensure stable and reliable operation of the engine, regularly check the following during use:*

*●is there any burning or discoloration on the engine casing.*

*●is the engine mount intact.*

*●is the air inlet and impeller intact.*

*●is there any leakage in the oil system and is the oil filter clogged.*

*●bearing: manually rotate the rotor and carefully distinguish the bearing sound. if there is a "rustling" sound, the bearing may be slightly damaged due to impurities or improper cooling. it is recommended to use clean fuel or replace the oil filter. if the bearings are clearly damaged after inspection, it is prohibited to use the engine again. you can log in to the swiwin official website and contact after-sales personnel to replace the bearings.*

*the regular maintenance cycle for the sw800pro engine is:25 hours per accumulated operating time.*

# 12. AFTER SALES SERVICE

## LIMITED LIABILITY WARRANTY

*1.the service life of the engine is directly related to the operating environment and operating methods. the engine uses the simplest structure to achieve the most extreme working state, and each component is designed and produced to the extreme. the working conditions are extremely harsh. do not disassemble the intake duct and main shaft structure by yourself. once the engine is disassembled, it must be precisely reinstalled according to specifications to achieve its original performance. random assembly will cause the vortex jet body to lose balance, and high-speed operation will cause serious consequences.*

*2. swiwin promises to provide free product warranty service within the valid warranty period from the date of product sale, and customers do not need to pay for replacement parts. customers are requested to directly contact xuanyun's official after-sales service center to handle product repair matters.*

***(1 the implementation of free warranty service must meet the following conditions***

*a. the warranty period is 1 year from the date of product sale or within 25 hours of cumulative product operation (whichever comes first);*

*b. if the self purchased product is used normally within the prescribed product warranty period and experiences non-human performance failures;*

*c. no unauthorized disassembly, modification or installation without official instructions, or other faults caused by non-human factors;*

*d. the machine number, factory label, and other markings show no signs of tearing or alteration;*

***(2 the following situations do not fall under the scope of free product warranty services:***

*a. accidents such as collisions, burns, and crashes caused by human factors other than product quality issues;*

*b. damage caused by unauthorized modification, disassembly, or shell opening without*

*official instructions;*

*c. damage caused by incorrect installation, use, and operation not following the instructions in the manual;*

*d. damage caused by all operational actions not following the product manual;*

*e. damage caused by handling in harsh environments, such as strong winds, rainy days, sandstorms, etc;*

*f. damage caused by manipulation in complex electromagnetic environments or strong interference sources, such as mining areas, transmission towers, high-voltage lines, substations, etc;*

*g. damage caused by interference with other wireless devices during operation, such as interference from transmitters, image transmission signals, wifi signals, etc;*

*h. damage caused by takeoff at a weight greater than takeoff weight;*

*i. damage caused by forced flight in the event of aging or damage to components;*

***(3 warranty notice)***

*a. users need to pay for the express delivery fee to return the problematic product. after receiving the problematic machine, xuanyun after-sales service center will conduct fault detection on the product to determine the responsibility for the problem. if it is a quality defect of the product itself, xuanyun after sales service center is responsible for bearing the inspection fees, material fees, labor fees, and courier fees to repair the product and send it back;*

*b. if the product does not meet the free repair conditions after testing, negotiate with the user to return the original machine and bear the shipping cost or pay for repair;*

*c. if the problem you encounter is not covered by the warranty or caused by human factors, we will charge inspection fees, replacement parts fees, testing fees, and labor fees according to the nature of the problem, and will communicate with the customer in advance;*

*d. please call xuanyun after-sales service center or consult through official wechat for the entire repair process and repair records;*

*e. the product must be properly packaged during return shipping to prevent damage or loss*

*during transportation, and we will not be responsible for compensation.*

*3. if you need the engine to be returned to the factory for maintenance and repair, please log in to the official website of swiwin company* ***http://www.swiwin.com or swiwin official account*** *to contact customer service, fill in the《engine maintenance application form》, and prepare the following relevant contents:*

| ENGINE MAINTENANCE APPLICATION FORM | | | |
|---|---|---|---|
| NAME | | THE DATE OF ISSUANCE | |
| Shipping Address | | | |
| Fault Description | _____ Model: | | |
| Other Service Requirements | ☐ Technical Consultation<br>☐ Engine Maintenance<br>☐ Accessories Procurement | | |

# 13. DISCLAIMER

*1. when the engine is running, unrelated personnel are strictly prohibited from standing around the engine. operators can only operate the engine within the safe operating area. the company will not be held responsible for any accidents caused by entering the dangerous area to operate the engine without following safety reminders.*

*2. most of the engine components are precision machined parts, and the rotor of the engine has already undergone precision dynamic balancing before assembly. disassembling and assembling the engine at will will will damage the rotor dynamic balance, leading to excessive vibration during engine operation and affecting the engine's service life. in severe cases, it may cause safety accidents. our company shall not be held responsible for any work accidents or personal injuries caused by the customer's unauthorized disassembly and assembly of the engine.*

*3. the area near the intake duct during engine operation is a high-risk zone, and any unsecured or loosely secured object may be sucked into the engine. it is strictly prohibited to reach any object or hand near the intake duct during engine operation. the company shall not be held responsible for any consequences arising from failure to follow the operating procedures.*

*4. it is strictly prohibited for the engine to work under overload. engine operating speed exceeding the maximum speed may cause the strength of engine structural components to fail, which may lead to serious safety accidents. our company shall not be held responsible for any losses or consequences caused by overloading the engine.*

*5. the company shall not be held responsible for any losses or accidents caused by unauthorized modification or use of the engine.*

*6.this internal combustion engine is only used for model rc, toy aircraft as power source,it can only be used for model airplane flight, model airplane flying show and other entertainment activities. according to the export control law of the people's republic of china and the export control law of the usa. it is strictly forbidden to modify the product for illegal use. it is strictly prohibited to resell the product to the export restriction country under the law in china. otherwise, all consequences will be at your own risk.*

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