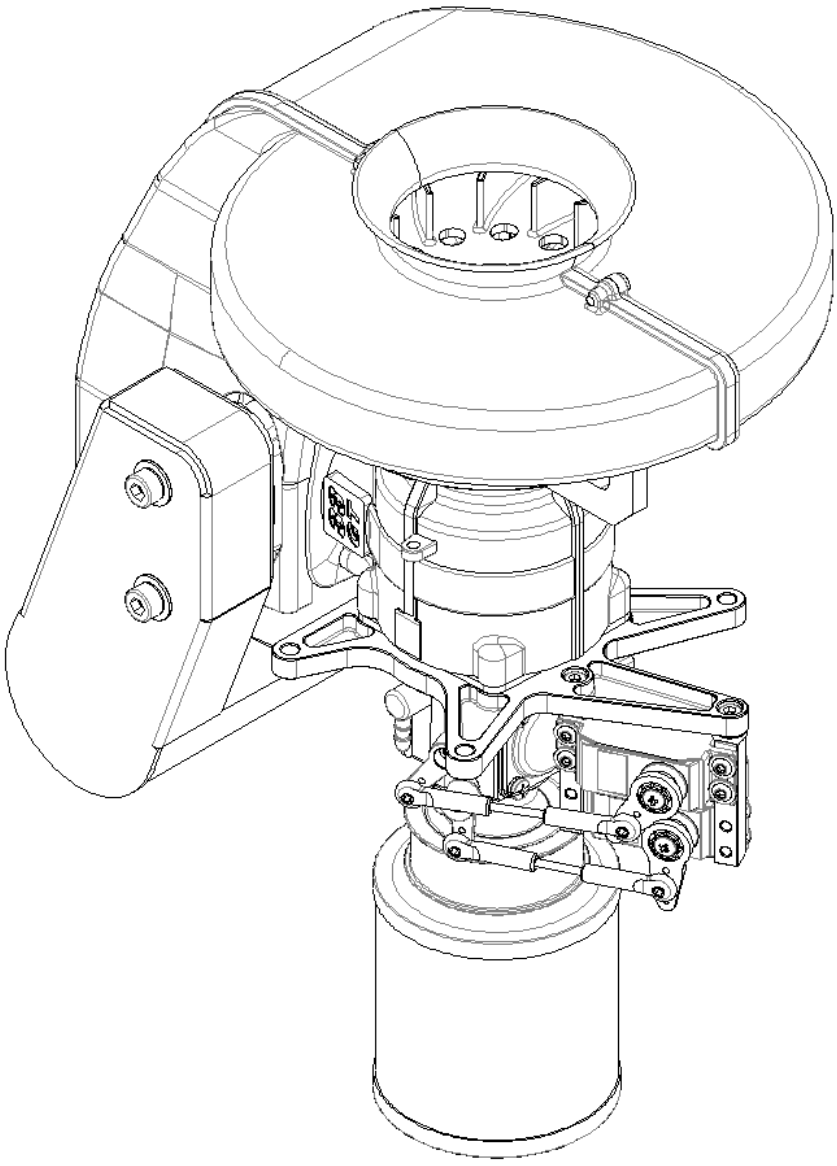
O.S. PROFESSIONAL

Generator for UAV

GT33REU

OPERATION MANUAL Ver. 2.03

2021.09.02



O.S. ENGINES MFG. CO., LTD.

600938600000

CONTENTS

1. ABOUT THE MANUAL

It is of vital importance, before attempting to operate the engine, to read this booklet and adhere to the advice contained herein. The "SAFETY INSTRUCTIONS AND WARNINGS" (page 2-3) must be read first.

2. SAFETY INSTRUCTIONS AND WARNINGS

(1)The power of the engine is can harm you, or others, if it is misused or abused. As an owner you are responsible for the safe operation of the engine, so act with discretion and care all times.

(2) The advice which follows is grouped under two headings according to the degree of damage or danger which might arise through misuse or neglect.

WARNING -These cover events which might involve serious (in extreme circumstances, even fatal) injury.

CAUTION - These cover the many other possibilities, generally less obvious sources of danger, but which, under certain circumstances, may also cause damage or injury.

(3) WARNINGS

① Never touch and allow any object to contact with the rotating propeller and do not crouch over the engine when it is running.

② Gasoline is poisonous. Do not allow it to contact with the eyes or mouth. Always store it in a clearly marked container in a cool and dark place and out of the reach of children. There is a possibility that it may damage your health.

③ Gasoline is highly flammable. Keep it away from an open flame, excessive heat, sources of sparks, or anything else which might cause it to ignite. Do not smoke or allow anyone else to smoke near to it.

④ Carry out the mixing of the gasoline and oil outdoors or in a well-ventilated place away from any source of fire to prevent the possibility of a fire.

⑤ Refill the fuel tank only after the engine is well cooled down, or there is a danger of fire.

⑥ The engine generates considerable heat. Do not touch any part of it until it has cooled.

⑦ Observe the laws and regulations in each country and district concerning the usage, transportation and storage of gasoline. Ask details at fire station in each district.

⑧ Never operate the engine in an enclosed space. Th engines exhaust deadly carbon-monoxide. Run the engine only in an open area.

⑨ Do not operate the engine or UAV alone or there is a possibility of injury.

⑩ Observe the instruction of LI-Po battery since it may bring the danger of fire.

(4)CAUTIONS

① This product is designed for UAVs. Do not attempt to use it for any other purpose.

② Start the engine only after installing it in a UAV. Do not start the engine before installing it in the aircraft, or there is a possibility of injury.

③ Be sure to use the accessory silencer (muffler). Frequent exposure to an open exhaust may eventually impair your hearing.

④ Mount the engine in a UAV surely, following the manufacturers' recommendations.

⑤ For safety reason, keep all onlookers well back (at least 30 meters) when preparing a UAV for flight.

⑥ When checking a spark plug with the power source on, do not hold the spark plug, the plug cap, and the high-tension cord, or you will get a shock.

⑦ Always check the throttle linkage. If it is disconnected, throttle action becomes uncontrollable, which may result in a serious accident.

⑧ Do not wear loose clothing (ties, shirt sleeves, scarves, etc.), do not touch the propeller. Do not carry loose objects (such as pencils, screwdrivers, etc.) in a shirt pocket from where they could fall through the propeller arc.

⑨ To wear safety glasses and an ear muffs is strongly recommended. Never attempt to start the engine with a bare hand.
⑩ Do not start the engine in an area containing loose gravel or sand. The propeller may throw such material in your face and eyes and may cause injury.
⑪ Do not carry a UAV with the engine running. It may cause injury.
⑫ Turn off the switch of the ignition module with a kill switch.
⑬ The engine may restart if you crank the engine right after stopping the engine even the switch of the ignition module is turned off. Do not crank the engine.
⑭ To stop the engine when it has started unintentionally even with the transmitter turned off, install a switch, which can be controlled from the outside.
⑮ Make the Kill Switch activated to stop the engine when it has started unintentionally.

3. ABOUT GT33REU

(1) It is an electric generator for UAVs.
(2) The engine for the generator is an 30cc air-cooled 2-stroke engine.
(3) An engine starter integrated with electric generator is quipped in alignment of the engine crankshaft.
(4) SGC-1095HV starter/generator controller integrates an ESC for the starter and regulate rectifier for the generator for reducing the weight and downsizing. (PATENTED)
(5) EM-100 Engine Management System can charge a 12-cell Li-Po battery with fixed voltage and current. It is not balanced, and a Li-Po battery with BMS is required.
(6) The engine, starter, and generator are integrated for light weight.
(7) EM-100 Engine management System automatically controls generator electricity corresponding to the load.
(8) With accessory sensors, system voltage, generating electricity, generating power, charging current, engine rpm, and cylinder head temperature (CHT) and be monitored in the display of Futaba transmitter T18SZ, T16SZ, T16IZ and FMT-04. With optional sensor, you can also monitor the fuel level in the tank.
(9) For full performance, Futaba transmitter T18SZ, T16SZ, T16IZ or FMT-04 is needed.
(10) OSP-120 is a regulator with an input voltage of 15V to 55V and an output voltage of 12.4V, and can be input from a generator as well as LiPo. Always use OSP-120 between a battery and a EM-100.

4. SPECIFICATIONS

(1) GT33REU
① Description: 3-phase AC electric generator for UAV
② Dimensions: Shown in page 24
③ Weight: 2,200g
④ Rated voltage: 48V
⑤ Rated current: 21A
⑥ Rated power (continuous): 1.0kW
⑦ How to start: by a built-in starter motor
⑧ Fuel: Mixed gasoline with 2-stroke oil (25:1)
⑨ Type of engine: air-cooled, 2-stroke, reciprocating single cylinder engine
⑩ Displacement (bore x stroke): 33cc (36mm x 32.4mm)
⑪ Carburetor: diaphragm type, Walbro WT
⑫ Spark plug: M10mm (NGK CM-6 type)
⑬ Counter-electromotive force constant (CEMF): 7.41mV/rpm
⑭ Phase-to-phase resistance: 30mΩ
⑮ Operating environment: atmospheric temperature: −10～+40℃, altitude: 0～3,000m above sea level
⑯ Endurance time: Approx. 500hours (overhauling needed every 100-hour operation)

(2) IG-08A
① Type: CDI ignitor (battery operated)
② Dimensions: 63 x 28 x 22mm
③ Weight: 95g
④ Input voltage: 6.0～12.6V
⑤ Consumption of electricity: 400mA/6,000rpm

(3) SGC-1095HV
① Type: Starter/generator controller
② Dimensions: 115 x 50 x 20mm
③ Weight: 210g
④ Rated voltage: 48V
⑤ Rated power generation (continuous): 1.0kW
⑥ Driving current of the starter: 50A (Max. 30 seconds)
⑦ Withstand voltage: 60V

(4) EM-100
① Type: engine management system
② Dimensions: 70 x 64 x 21mm
③ Weight: 73g
④ Input voltage (insulated): 10～18V (Li-Po 3 cell ～ Li-HV 4 cell)
⑤ Output voltage (insulated): 6V
⑥ Output current (insulated): 2A (continuous) / 3A (Max. 30 seconds)
⑦ Output voltage: 7.4V
⑧ Output current: 8A (continuous) / 12A (Max. 30 seconds)
⑨ Communication: S.BUS2, RS-485 (1Mbps), or CAN

(5) OSP-120
① Type: Regulator for EM-100
② Dimensions: 37 x 82 x 15.5mm
③ Weight: 100g
④ Input voltage: 15～55V
⑤ Output voltage: 12.4V
⑥ Output current: 7A (continuous) / 10A (Max. 30 seconds)

5. NAMES OF THE PARTS OF GT33REU

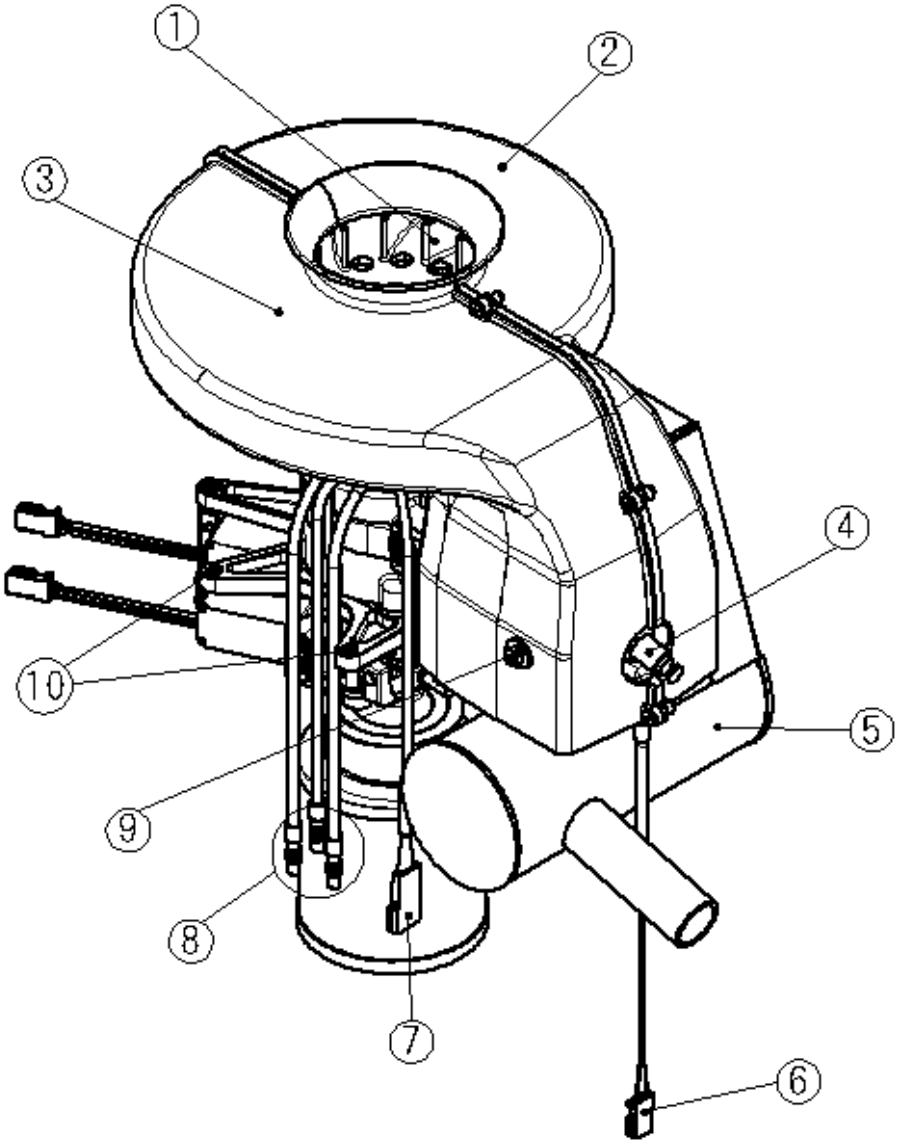


Fig.1　GT33REU main body

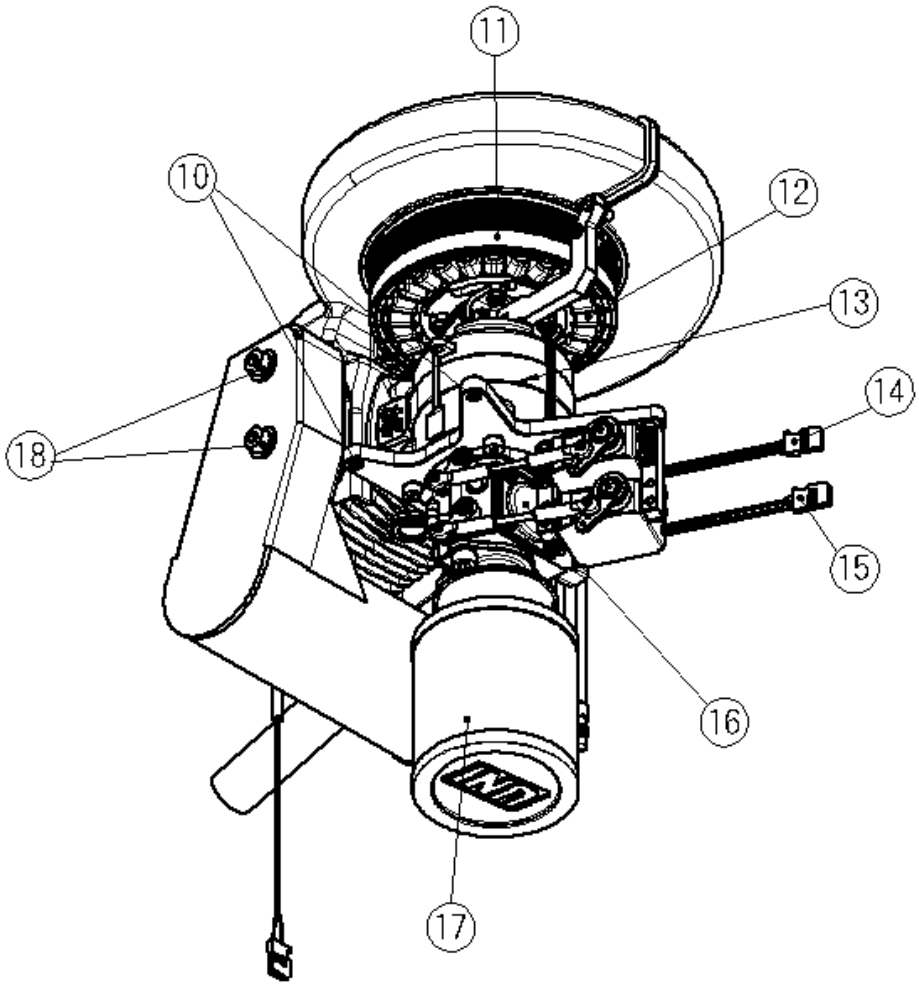


Fig.2　GT33REU main body from the different angle

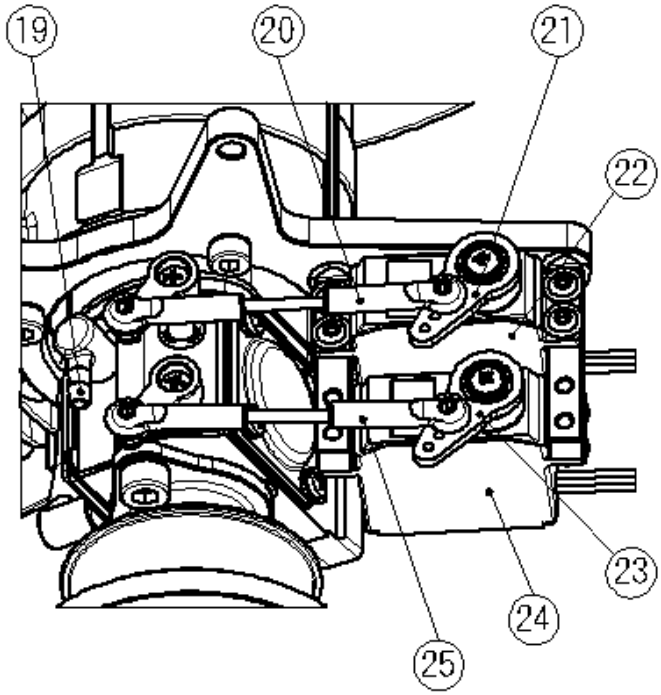


Fig.3　Servo and carburetor

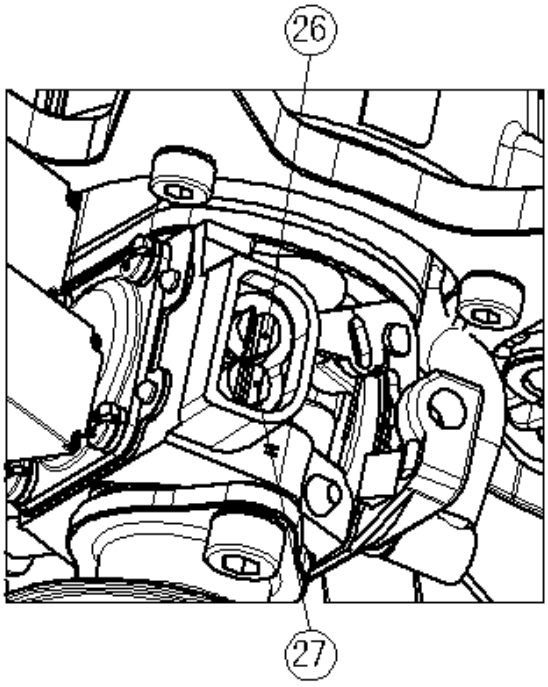


Fig.4　Carburetor

No.	名称	Name	備考/Note
1	クーリングファン	Cooling fan	
2	ファンシュラウド R	Fan shroud R	
3	ファンシュラウド L	Fan shroud L	
4	プラグ CM-6	Spark plug CM-6	
5	E-5030 サイレンサー	E-5030 Silencer	
6	温度センサーコネクター	Temp. sensor connector	
7	回転センサーコネクター	R.P.M. sensor connector	
8	スターター発電機リード	Starter generator lead	
9	ファンシュラウド取付ねじ	Fan shroud screw	
10	マウント	Mount	
11	スターター発電機ローター	Starter generator rotor	
12	スターター発電機ステーター	Starter generator stator	
13	エンジン	Engine	
14	スロットルサーボコネクター	Throttle servo connector	
15	チョークサーボコネクター	Choke servo connector	
16	キャブレター	Carburetor	
17	エアクリーナー	Air cleaner	
18	サイレンサー取付ねじ	Silencer screw	
19	燃料インレット	Fuel inlet	
20	エンジンコントロールロッド	Throttle rod	
21	エンジンコントロールサーボホーン	Throttle servo horn	
22	エンジンコントロールサーボ	Throttle servo	
23	チョークサーボホーン	Choke servo horn	
24	チョークサーボ	Choke servo	
25	チョークロッド	Choke rod	
26	スローニードル	Slow needle	
27	ハイニードル	High needle	
28			
29			
30			

LIST 1

6. NAMES OF THE PARTS OF SGC-1095HV, EM-100, IG-08A, OSP-120

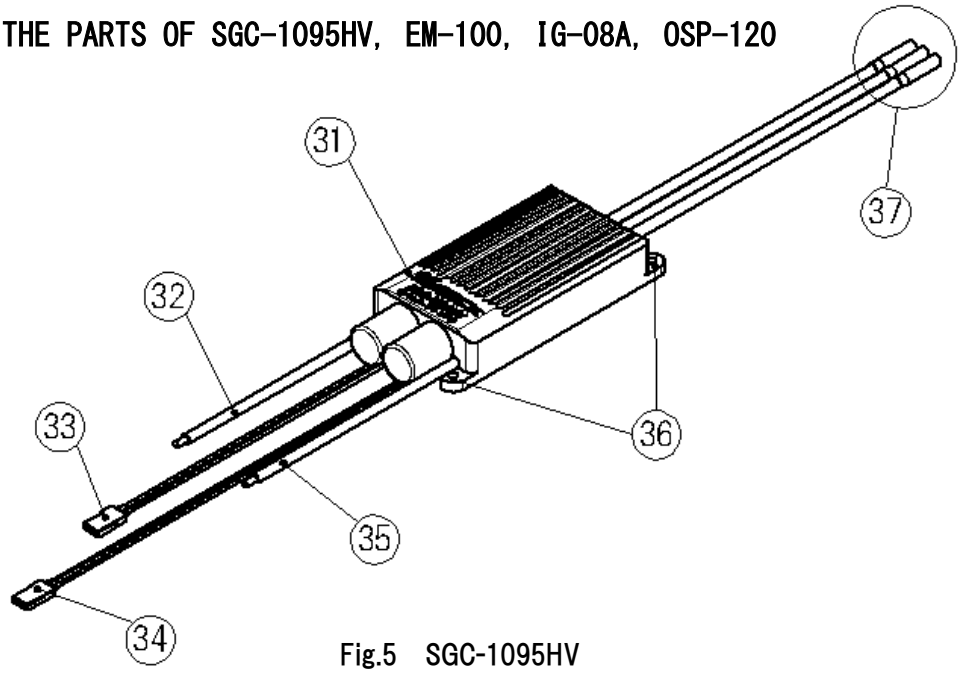


Fig.5 SGC-1095HV

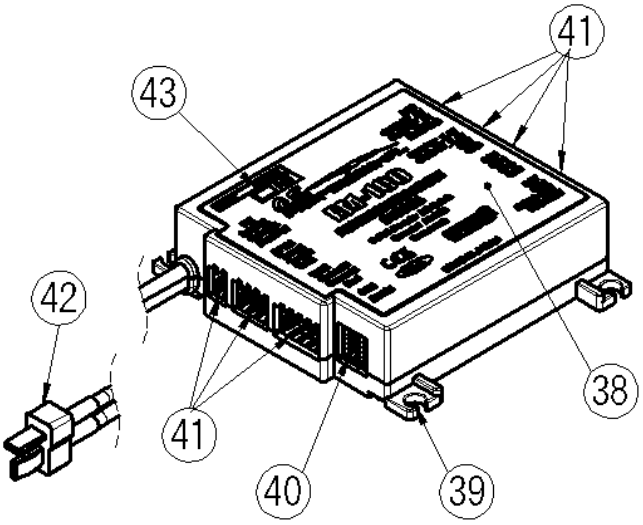


Fig.6 EM-100

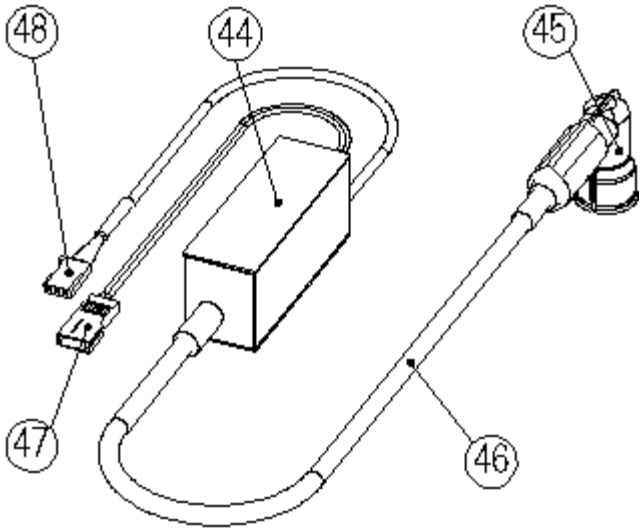


Fig.7 IG-08A

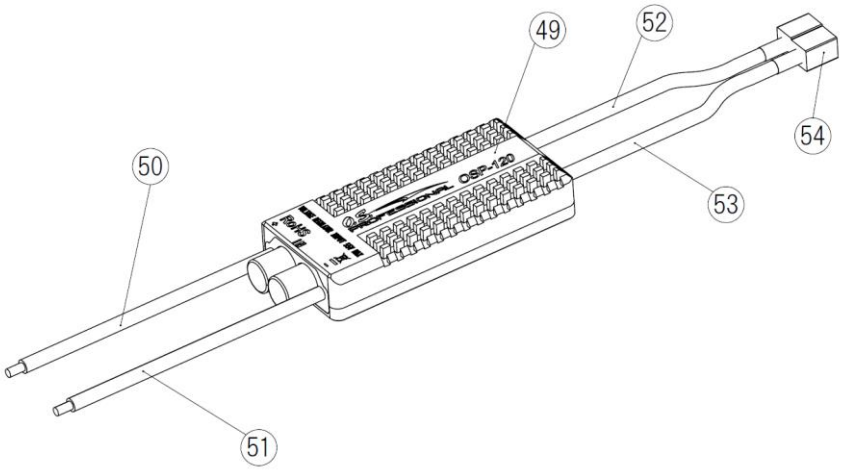


Fig.8 OSP-120

No.	名称	Name	備考/Note
31	SGC-1095HV 本体	SGC-1095HV Body	
32	電源入出力リード(+)赤	Power In/Out lead wire (+) Red	
33	設定コネクター(茶、赤、橙)	Setting connector (Brown、Red、Orange)	不使用/ No use
34	信号入力コネクター(白、赤、黒)	Signal connector (White、Red、Black)	
35	電源入出力リード(−)黒	Power In/Out lead wire (−) Black	
36	マウント	Mount	
37	スターター発電機リード	Starter generator lead	
38	EM-100 本体	EM-100 Body	
39	マウント	Mount	
40	シリアル通信ポート	Serial communication port	
41	各種コネクター接続ポート	Connecting port for other connectors	
42	電源コネクター	Power connector	
43	状態表示 LED	Status LED	
44	IG-08A 本体	IG-08A Body	
45	プラグキャップ	Plug cap	
46	ハイテンションコード	High tension cord	
47	電源コネクター	Power connector	
48	回転センサーコネクター	R.P.M. sensor connector	
49	OSP-120 本体	OSP-120 Body	
50	電源入力リード(+)赤	Power In lead wire (+) Red	
51	電源入力リード(−)黒	Power In lead wire (−) Black	
52	電源出力リード(+)赤	Power Out lead wire (+) Red	
53	電源出力リード(−)黒	Power Out lead wire (−) Black	
54	電源コネクター	Power connector	
55			

LIST 2

7. SYSTEM DIAGRAM OF GT33REU

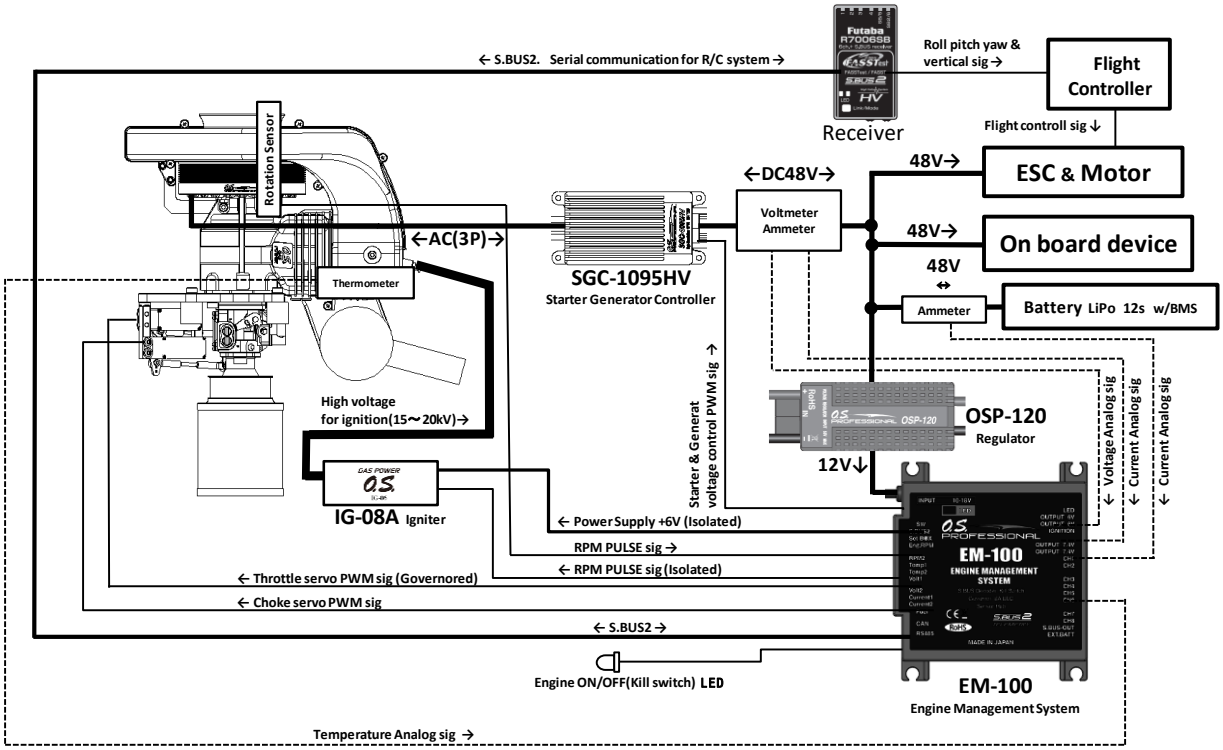


Fig.9 SYSTEM BLOCK DIAGRAM OF GT33REU

8. OPERATION OF GT33REU

(1) Engine RPM governor

The program of engine RPM governor activates to maintain the idling rpm of 3,500rpm when the engine is started. After starting the engine, when the battery supplies electricity to on-board equipment higher than 0.3kW(6A), the rpm of engine automatically rises to 6,500rpm and the engine starts to generate electricity. When the engine is generating electricity, the rpm of engine changes according to electric consumption. The fuel consumption and noise level also change accordingly. (See LIST 3)

When the electric consumption drops to 0.3kW or less, the rpm of engine automatically comes back to 3,500rpm and the engine stops generating electricity.

condition	Engine rpm	Electric consumption	remark
High electric consumption	7,400rpm	1.2kW or more	During power generation
	7,300rpm	1.1kW or more, less than 1.2kW	
Standard electric consumption	7,200rpm	1.0kW or more, less than 1.1kW	During power generation
	7,050rpm	0.9kW or more, less than 1.0kW	
Low electric consumption	6,750rpm	0.8kW or more, less than 0.9kW	During power generation
	6,500rpm	0.3kW or more, less than 0.8kW	
Idling	3,500rpm	Less than 0.3kW	Right after starting the engine, without power generation

LIST 3

(2) Control of maximum electric generation

Monitoring the current and voltage of the electricity generated by GT33REU and regulating the maximum generating power can avoid engine stall and overheating of the engine and the engine starter.

Note 1: If the load power exceeds the maximum power generation power (1.25kW), the power generation supply will be stopped.

Note 2: Regulating the maximum electric generation does not mean controlling the maximum load of the whole system. In case a UAV is hovering using only the generated electricity, and run out of the battery soaring in the sky, or controlling its attitude against a gust of wind, the UAV cannot continue hovering because the whole system needs electricity for charging the battery as well as the electricity for hovering.

(3) Control of the charging

Monitor and regulate the electric current (Max 48V) and voltage (Max 5A) to the Li-Po battery for normal charging.

(4) Control for Preventing overheating

It is to monitor CHT (Cylinder Head Temperature). Then the CHT rises to 200℃ or more, it regulates the generating electricity to lower the temperature and to prevent the cylinder head from overheating. When the CHT goes down to 195℃ or lower, the control is cancelled.

(5) Engine kill switch

It is to stop the engine by cutting off power supply to the ignition module with a transmitter.

9. ON-BOARD BATTERY

It is necessary to equip GT33REU with a 12S Li-Po battery because output voltage of GT33REU is 48V. We recommend a battery with 3,000mAh or more capacity otherwise RPM of the engine and output voltage may become unstable.

GT33REU can charge a battery but no balancing charging device. Use a battery with BMS (Battery Managing System) or balance the cells after every 2-3 flights. Use a Li-Po battery after charging more than 48V. When a battery lower than 48V is used, the generator supplies electricity to charge the battery as well as to fly and it may not supply enough power to fly. In case voltage of the on-board battery is lower than 48V, charge it to 48V.

WARNING

Note 1: Read and follow the instructions of a Li-Po battery you are using to avoid fire.

Note 2: Batteries other than 12S Li-Po battery should be charged with over-voltage, or over-discharged and that may cause fire.

Note 3: The maximum current for charging is 5A. Select a battery not to exceed the maximum current for charging and discharging to avoid fire.

10. ELECTRIC POWER REGULATOR FOR EM-100

EM-100 requires power source of 10 - 18V. The generating electricity is 48V, so you need to prepare a stepdown regulator from 48V to 10 - 18V. Please install our regulator (our part number 74001180 OSP-120).

11. INSTALLATION

(1)Installation of GT33REU

Screws for installation (4 pieces) are not included in this product. Use your own. They should be M4 cap screws made of steel and have nominal tensile strength 1200N/㎟ or more. Screw in cap screws 5mm or deeper into the UAV. Follow the tightening torque mentioned in the instructions of the UAV, if not, tighten them at 3.6N/m.

In case anti-vibration rubbers are used, make sure the vibrating engine and parts do not interfere the UAV with contact.

(2)Installation of IG-08A ignition module

① Stick IG-08A to a frame of the UAV with foam mounting tape and cable ties.
② Connect the plug cap to the spark plug on the engine. Apply silicon oil to the spark plug in case it is hard to connect and screw in the plug cap.
③ IG-08A uses high voltage, higher than 15Kv and the high voltage produces noise, which creates harmful effects to other electrical devices. Isolate the ignition module as far as possible from other electrical devices and cables. The high-tension code of IG-08A needs to be wrapped with spiral cable tube not to contact to a frame of the UAV. Do not bind the high-tension code together with other electric cables.

(3)Installation of SGC-1095HV

Screws are not provided to mount SGC-1095HV. Use your own. They should be M3 cap screws made of steel and have nominal tensile strength 1200N/㎟ or more. Screw in cap screws 3mm or deeper into the UAV. Follow the tightening torque mentioned in the instructions of the UAV, if not, tighten them at 1.2N/m.

(4)Installation of EM-100

Press both rubber and metal grommets in the bracket holes of EM-100. They are standard accessories in the kit.

Screws are not provided to mount EM-100. Use your own. Screw in the screws 3mm or deeper into the UAV. Follow the tightening torque mentioned in the instructions of the UAV, if not, tighten them at 0.25N/m, no more. Apply Loctite® medium strength to the screw threads.

(5)Installation of the air cleaner

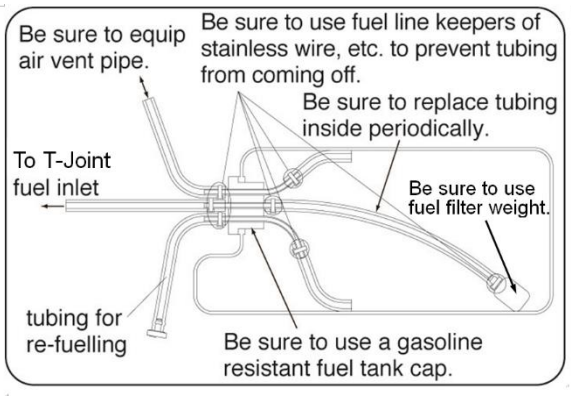
Peel off the warning label and attach the black rubber adapter in the air cleaner. Fit the air cleaner to the aluminum air cleaner adapter of the carburetor binding it with a hose band. (tightening torque: 2.0N/m)

(6)Installation of OSP-120

① Stick OSP-120 to a frame of the UAV with foam mounting tape and cable ties.
② The upper side of aluminum case of OSP-120 works as a heatsink head to dissipate heat. Do not fix OSP-120 to the UAV upside down. Do not wrap OSP-120 with sponge and other wrapping material. The heatsink head must be exposed to the air to maintain its cooling effect.

12. FUEL TANK

(1) GT33REU consumes approximately 700 - 1,200cc gasoline per hour though it depends on needle adjustment. Decide capacity of fuel tank according to your usage and flight time.
(2) Choose a gasoline resistant fuel tank. You cannot use a fuel tank for glow engines because the tank cap is not gasoline resistant.
(3) Wash a fuel tank with gasoline before the first use to wash off remaining plastic pieces and dusts.
(4) Use the following tube for piping.
Tygon® F-4040A, Fluoro rubber, or Nitrile rubber (I.D. 3.0 - 3.2mm, O.D. 6.0 - 6.4mm) The tubes should be replaced periodically because they harden with age. A tube in a fuel tank should be replaced in 6 months to one year.
(5)Fuel tank piping should be 3-way piping as shown in the above drawing. Use fuel line keepers made of φ0.6 - 0.8mm stainless steel wire to avoid the tubes coming off.



(6)In case of using a wide-mouthed fuel tank, set a fuel filter on a fuel inlet. Use one of them shown below in a fuel tank available from us.
Code no. 72403050 SUPER FILTER L
Code no. 72403051 SUPER FILTER S

13. PIPING OF THE FUEL

(1) Use clips in the accessories or stainless steel wire (φ0.6 ~ 0.8mm) to fix tubes to pipes.
(2) Piping from/to the fuel tank, the fuel filter, and the carburetor

①The fuel filter in the accessories must be used in the piping between the fuel tank and the carburetor. Attention for the direction of the fuel filter. See the drawing No.11.

②Length of each tube connection should have a margin of 10mm.

③Fix the tubes not to flap during flight. Do not press the tubes too strong when fix them.

(3) After completing the piping, fill the fuel up the tank and the tubes with gasoline, and close the air vent pip of the fuel tank waiting for half a day to check fuel leakage from each joint.

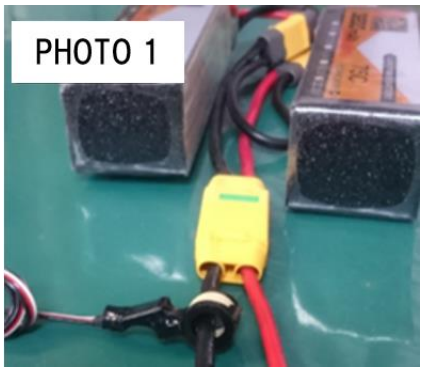
Note: Do the check of leakage outdoors or in a well-ventilated place away from any source of fire to prevent the possibility of a fire.

14. WIRING

(1) Wiring of the main power

Complete the wiring of the battery, the ESCs and electric motors for flying first.

Pass the negative (-) lead wire of the battery through a ring of electric current senser. Be careful of the direction of the current senser. It will not work if you set it upside down. See the attached Photo 1. to confirm which side is up.



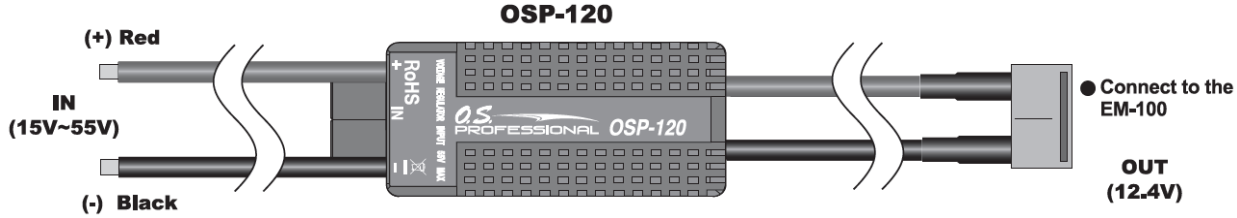
Note: Do the check of leakage outdoors or in a well-ventilated place away from any source of fire to prevent the possibility of a fire.

(2) Wiring of SGC-1095HV (starter/generator controller)

Complete the wiring of the red (+) lead wire and the black (-) lead wire to the main power source. Pass the negative (-) lead wire of the battery through a ring of electric current senser. Be careful of the direction of the current senser. It will not work if you set it upside down. See the above Photo 1 and 2 to confirm which side is up. Lead wires (AWG12 or equivalent) and connectors are not included in the kit. Use your own.

(3) Wiring of OSP-120 and EM-100

Connect the positive (+) lead wire of the battery to the red (+) wire coming from the input side of the OSP-120. Connect the negative (-) lead wire of the battery to the black (-) wire coming form the input side of the OSP-120. The GT33REU does not come with lead wires and connectors to connect to the OSP-120. Prepare your own. Connect the power output connector of the OSP-120 to the power connector of the EM-100.



WARNING

Note 1: Do not connect the OSP-120 and other regulators and batteries in parallel. It will cause fire, smoke, and damage.

Note 2: Never connect a battery reversely [+ to -]. It may cause fire, smoke, and damage.

(4) Wiring of the receiver and EM-100

Complete the wiring of the S.BUS2 port on the receiver and the S. BUS2 port in EM-100

(5) Wiring of the starter/generator

Complete the wiring between the starter generator and the controller SGC-1095HV. Connect the wires with the same color each other because it is 3-phase power.

(6) Wiring of the rotation sensor

Connect the rotation sensor to the "Eng. RPM" port in EM-100.

(7) Wiring of the engine control servo and the choke servo

① Connect the engine control servo to the "CH3" port in EM-100.

② Connect the choke servo to the "CH5" port in EM-100. Allot the choke servo channel to CH5 and allot the channel to a 2 or 3 way position switch. Set the direction of throttle stick, full open, and fully close positions.

(8) Wiring of the temperature sensor

Connect the temperature sensor to the "Temp1" port in EM-100.

(9) Wiring of the signal input connector of SGC-1095HV

Connect the signal input connector of SGC-1095HV to the "CH1" port of EM-100.

(10) Wiring of the voltage sensor

Connect the connector assembled in the above 14. (2) to the "Volt1" port in EM-100.

(11) Wiring of the Current sensor 1

Connect the connector assembled in the above 14. (1) to the "Current1" port in EM-100.

Connect the current sensor labeled "Current 1" to the cable tag.

(12) Wiring of the Current sensor 1

Connect the connector assembled in the above 14. (2) to the "Current2" port in EM-100.

Connect the current sensor labeled "Current 2" to the cable tag.

(13) Wiring of the IG-08A (ignition module)

Connect the power connector of IG-08A to the "OUTPUT_6V" port in EM-100. Use the accessory female-female extension code to connect IG-08A and the port because both of them have male connectors.

(14) Wiring of the Rotation sensor

Connect the rotation sensor connector of IG-08A to the "IGNITION" port in EM-100.

15. SETTING OF THE TRANSMITTER

Note: To fulfil all the function of GT33REU, it is necessary to use transmitter/receiver set of Futaba T18SZ, T16SZ, T16IZ or FMT-04. This manual is written assuming that one of the mentioned Futaba products you use.

(1) Channel for use

GT33REU requires 3 channels; ①Starter, ②Choke servo, ③Kill switch.

(2) Function setting

Set the Function, Servo Reverse, and End Point as follows.

① Starter

Function: CH=16, Control switch = SH

Servo reverse: Normal

End point: High limit=155, High travelling=140, Low travelling=100, Low limit=135

Sub-trim setting is also necessary in Operating mode. Set as follows.

Sub-trim: -50

② Choke servo

Function: CH=5, Control switch = SE

Servo reverse: Normal

End point: High limit=135, High travelling=100, Low travelling=100, Low limit=135

③ Kill switch

Function: CH=9, Control switch = SF

Servo reverse: Normal

End point: High limit=135, High travelling=100, Low travelling=100, Low limit=135

NOTE: We can send the data of transmitter setting by e-mail to you upon request.

(3)Telemetry settings

For the operation method, see the instruction manual of EM-100.

16. MIXING OF OIL

(1) Use the gasoline with high octane rating, 90 or more.

(2) Use high quality commercially available 2-stroke engine oil. Some of oil accumulates residues in combustion chamber and an exhaust port only in several hours' operation and causes a trouble. Check the combustion chamber if there is unusual residue in short period.

(3) Follow the oil manufacturer's recommendations concerning the mixture ratio of gasoline and oil. If there is no recommendation, mix with a 25:1 ratio. We have checked and approved the following oil mixture ratio. KLOTZ ModeLube (25:1). Castrol Power 1 – TTS Racing (25:1) (This does not mean we guarantee the quality of this oil.) Follow the instructions in the running-in section concerning the mixture for running-in.

(4) It is suggested to use optional accessory Super Filter L (Code No. 72403050) when filling a tank in a UAV from a container used for transportation or storing.

17. BREAKING IN

We have run the engine for around 10 minutes for adjustment and performance check, but we ask you to break in the engine as follows.

(1) For breaking in, adjust the fuel mixture rich.

(2) Use the fuel with 25:1 gasoline/oil mixture.

(3) Break in the engine around 1 hour.

(4) Add 300 – 800W load of electric generation to the engine during breaking in.

18. START-UP INSPECTION

Pre-operation inspections should be done as shown below.

items to be inspected	inspection contents	how to check
Mounting of GT33REU	Check if mounting bolts are properly tightened.	by visual inspection
Attachment of the silencer	Check if mounting bolts are properly tightened.	by visual inspection
Attachment of the air cleaner	Check if the mounting screw is properly tightened. Check if there is some foreign material on the surface of it.	by visual inspection
Mounting SGC-1095HV and EM-100 on a UAV	Check if mounting bolts are properly tightened.	by visual inspection
Mounting IG-08A and OSP-120	Check if they are properly mounted with double-sided tape, cable ties, and Velcro tape.	by visual inspection
exhaust pipe	Check the exhaust pipe if there is foreign material in it.	by visual inspection
Fan shroud L & R	Check if the mounting screw is properly tightened. Check if there is no crack or damage on the shrouds.	by visual inspection

cooling air passage for the fan shrouds	Check the air inlet/outlet, and duct if there is foreign material.	by visual inspection
plug cap	Check the plug cap if it is fixed firmly to a spark plug.	by visual inspection
ignitor high tension cord	Check if there is wear and dirt on it.	by visual inspection
fuel line	Check if tubes are frayed, kinked.	by visual inspection
	Check if tube clips are fit firmly.	
electric wirings	Check if there is no cut, wear, and dirt.	by visual inspection
	Check if the connectors are firmly connected.	
oil leakage	Check if there is oil leakage from the engine	by visual inspection
linkage	Check if rod ends and rods are firmly connected.	by visual inspection
	Check if servo horns and servos are firmly fixed with screws.	
remaining fuel in the tank	Check if a fuel tank is full.	by visual inspection
mixture of oil in the fuel	Check if gasoline and oil are mixed at correct ratio, 25:1.	by visual inspection

LIST 4

Follow the instructions of a UAV as well.

19. STARTING THE ENGINE

(1) Inducing fuel in the carburetor (needed only for the new installation or running out of gasoline in the previous flight)

① Turn on the transmitter.
② Turn on the UAV switch.
③ Make sure to turn off an ignitor switch.
④ Fully close the choke.
⑤ Run the engine starter until the fuel comes to right before the fuel inlet of the carburetor.

(2) Choke

① Turn on the transmitter.
② Turn on the UAV switch.
③ Make sure to turn off an ignitor switch.
④ Fully close the choke.
⑤ Run the engine starter until you hear first detonations. (See the following "Note").
⑥ Fully open the choke valve.

Note: Listen carefully to the first detonations. If everything goes well, you will hear the first detonations within 2 - 3 seconds after running the starter. In case you hear no detonations for 5 seconds or longer, make sure the above 20. (1) - (2) procedures again.

(3) Starting the engine

① Turn on the transmitter.
② Turn on the receiver switch.
③ Fully open the choke valve
④ Turn on the ignitor switch.
⑤ Tell the people around that you are starting the engine.
⑥ Run the starter. (In case the engine does not start after a few trials, return to the procedure 20. (2) and repeat the procedure.

(4) What to do when the engine does not start

Probably the followings are the causes.

・Fuel mixture is thick due to over-choke

・Fuel mixture is thin due to insufficient choke
・Ignitor does not work because the switch is turned off

In case all the above are not the causes, try the followings.

① Check the ignitor switch. It has to be turned ON. Check the on-board ignitor switch and the engine kill switch. Check if the battery is fully charged. Check the electric cables and connectors.

② Check if the engine is over-choked. Remove the spark plug and check if the ground electrode is soaked with gasoline.

In case of over-choke, follow the procedures below.

❶ Turn off the ignitor.
❷ Remove the plug can and the spark plug from the engine.
❸ Fully open the choke valve.
❹ Run the starter for 10 seconds.
❺ Wipe the spark plug up the gasoline or blow compressed air to dry it.
❻ Install the spark plug and the plug cap in the engine.

③ Check if the engine is sufficiently choked. (If the ground electrode is not moistened, or you do not smell gasoline from the exhaust outlet, the engine is not sufficiently choked.

In case the carburetor is not sufficiently choked after repeating the procedures 20. (2) – (3), the system should be malfunctioning. Check all the procedures 11. – 14. Also Check the dust in the fuel filter.

After checking all the above and still the choking problem continues, disassemble the carburetor and clean it according to the maintenance manual.

20. WARMING UP THE ENGINE

As a carburetor type, the engine sometimes hesitates, stalls, and has unstable idling when Cylinder Head Temperature (CHT) is low, below 80℃. Warm up for about 1 minute.

21. INSPECTIONS BEFORE FLIGHT

Check the following items after starting and warming up the engine.

GT33REU inspection contents		
items	contents	Inspection Method
idling	Check if the engine runs stable at idling.	hearing/ using tachometer
Engine stop switch	Check if the engine stops switch works.	Visual inspection
ignitor switch	Check whether the engine stops when the ignitor switch is turned off.	Visual inspection
noise	Check if you hear unusual noise.	Hearing the sounds
smell	Check if you smell abnormal odor.	Smell the whole engine
radio control system	Check if all the equipment works correctly when the engine is running. Do the distance test and see if it is working normally with various attitudes of the UAV.	visual inspection

LIST 5

Check and follow the instruction of UAV for inspection before flight.

22. FLIGHT

(1) Be prepared for unexpected troubles such as engine stall during flight.

(2) It is recommended for monitoring the engine temperature, the electric power, the degree of engine control

servo open, the voltage of the main power source, the generating electric current, the charging/discharging current, the engine rpm, the fuel level (an optional fuel level sensor is needed), by the telemetry function during flight.

(3) flight procedures

① Make sure that the charging/discharging current is less than 1A or discharging. The value of charging /discharging current is not stable. So determine the midpoint. In case the charging/discharging current is 1A or more, wait until the charging/discharging current comes down to less 1A or discharging (in other words, charging to the battery). (Refer to 8. OPERATION OF GT33REU (2) Control of maximum electric generation, Note 2)

② After mounting your electric motor(s) and equipment, hover the UAV and check if the generating electricity is around 1.9kW or less. Check also if voltage of the main power is not dropping, in other words, the battery is discharging.

③ Hover the UAV with the circumstances of ② for around 10 minutes and check if the CHT (Cylinder Head Temperature) is less than 140℃. In case the CHT is 140℃ or higher, land the UAV and adjust the carburetor again according to "23. ADJUSTMENT OF THE CARBURETOR", which is coming below.

CAUTION

The engine may have a possibility of overheating and other damages when the CHT rises to 140℃ or higher.

(4) cooling down the engine after flight

Keep the engine at idling on the ground until the CHT comes down to 100℃ or lower.

CAUTION

If the engine is not properly cooled down after the flight, it remains very hot and will be difficult to be restarted. The heat of the engine is transmitted to other parts of the UAV and may cause malfunction.

(5) Stopping the engine

WARNING

Use the equipped Kill Switch to stop the engine to avoid injuring. Use the ignitor switch on board only when the Kill Switch cannot stop the engine.

23. ADJUSTMENT OF THE CARBURETOR

(1) We ran the engine and adjusted the carburetor before shipment. So it should work flawlessly except for using it in unusual conditions: operation in extremely cold/hot temperature, using extremely thick/thin oil etc. Adjust the carburetor only when you encounter the following issues.

① The engine starts but stalls as the throttle is opening.

② The rpm of the engine reaches the set value of the governor, but the engine stalls, or the rpm goes down lower than the set rpm of the governor when it is switched to "Generator Mode".

③ Although the electric power generation is lower than the fixed rate 1.0kW, the CHT rises up to 140℃ or higher.

④ The rpm of the engine gradually comes down during continuous idling, and the engine stalls at last.

⑤ The CHT does not rise up to 80℃ or higher although the engine is generating enough electricity.

⑥ The rpm of the engine fluctuates 300rpm or more against the set value of the governor under the constant load.

⑦ The throttle servo opens 70% or more constantly with the CHT lower than 140℃ under the constant load.

(2) Adjustment range of the slow needle and the high needle

Fig.12 shows the adjustment range. The slow needle affects even full throttle range and the high needle has an effect even to 1/4 throttle opening. Both needles give an effect each other in a wide range generally for gasoline engine carburetors, so both needles need to be adjusted for fine tuning. Adjust the slow needle first, then the high needle.

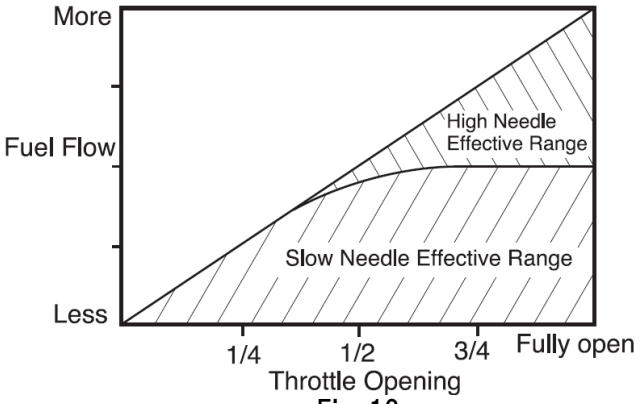


Fig. 12

(3) The default setting of the slow and the high needle.

The following are the default settings.

Slow needle: 2.0 turns from the fully closed position (2 turns)

High needle: 1.5 turns from the fully closed position (1-1/2 turns)

When you are at a loss in adjustment, or after disassembling the carburetor for maintenance, start the adjustment from the default needle position.

(4) Adjustment of the slow needle

① Set the needle at the default position and make sure the issues in the above, "23. ADJUSTMENT OF THE CARBURETOR (1) ①～③" do not happen or solved. In case the troubles are not solved, check the fuel filter, the fuel tubes, or the fuel tank if dusts are clogged in it.

② Adjust the payload to make the electric power generation about 1.0kW during hovering.

③ Keep hovering around 10 minutes and check the CHT. If it is 130～140℃(about outside temperature +110℃), the slow needle adjustment is completed.

④ In case the CHT is 140℃ or higher, open the needle 30 degrees (turn CCW, counter-clockwise) and repeat the above procedure ③ until it is improved.

⑤ In case the CHT is 130℃ or lower, close the needle 30 degrees (turn CW, clockwise) and repeat the above procedure ③ until it is improved.

(5) Adjustment of the high needle

After completing the adjustment of the slow needle, the engine works fine most of the time with the high needle at the default setting. Proceed the following procedures only when you have an issue with the default setting of the high needle.

① Fix the UAV to the ground not to hover and fly.

② Start the engine for warming up.

③ Try to hover the UAV with fixing it to the ground.

④ Try to hover with full power. Check if the rpm of the engine and the set rpm of the governor shows the same value. The CHT necessarily becomes higher during adjustment of the high needle, and the engine tend to overheat. Keep the maximum engine output shorter than 10 seconds when you adjust the high needle.

⑤ Stop trying to hover and keep the engine at idling. Close the high needle 30 degrees (turn CW).

⑥ Repeat the above procedures ③～⑤ and find out a position at which the rpm of the engine comes down lower than the set rpm of the governor. The best high needle position is 90 degrees open (turn CCW)from the high needle position you have found out.

Note: The CHT necessarily becomes higher during adjustment of the high needle, and the engine tend to overheat. Keep the maximum engine output shorter than 10 seconds when you adjust the high needle.

24. INSPECTIONS AND TIGHTENING SCREWS AFTER THE FIRST FLIGHT

Check the following after the first flight of a UAV, on which the engine is mounted.

(1) Tightening the fixing screws of the silencer

The silencer fixing nuts and screws become loose due to the heat and vibration during the flight. Tighten them again especially after the first flight with tightening torque 3.6N/m.

(2) Tightening the engine mounting screws

The engine mounting screws tend to become loose due to the head and vibration. A UAV may have considerable damage if it happens during flight. Make sure to tighten the screws after every flight with

tightening torque 3.6N/m.

(3)Tightening the fan shroud screws

The fan shroud fixing screws tend to become loose due to the heat and vibration. A UAV may have considerable damage if it happens during flight. Make sure to tighten the screws after every flight with tightening torque 1.5N/m.

(4)Checking each part of aircraft

The parts and screws of a UAV become loose due to the heat and vibration. Check them to make sure every part has been tightened following instructions of a UAV.

25. OPERATION LOG

Inspection and maintenance of this product is to be performed periodically based on operating hours. It is necessary for you to write down operating log: date, place, starting time and ending time, each operating time, total operating time, and remarks.

26. PERIODICAL INSPECTION AND MAINTENANCE

Read the "GT33REU Maintenance Manual" for the inspection and maintenance.

Remove the cowling for inspection.

(1) Inspection after 25-hour operation

①Fuel tubes
②Fuel filter
③Plug cap and high tension cord
④Spark plug
⑤Throttle linkage
⑥Throttle servo
⑦Various fixing screws
⑧Various harnesses

(2) Inspection after 50-hour operation(Refer to the maintenance manual)

Maintain the items below in addition to the inspection after 25-hour operation.

① Remove carbon in a combustion chamber.
② Electric generator

(3) Inspection after 100-hour operation(Refer to the maintenance manual)

Follow the GT120THU maintenance manual to inspect the items below in addition to the inspection after 50-hour operation.

① Disassemble the engine and inspect every part.
② Replace a fuel filter.
③ Replace the throttle servo and the choke servo.
④ Replace the fuel tubes.

27. AFTER-SALES SERVICE

For after sale service of the engine unit, contact us directly.

28. EXPLODED VIEW

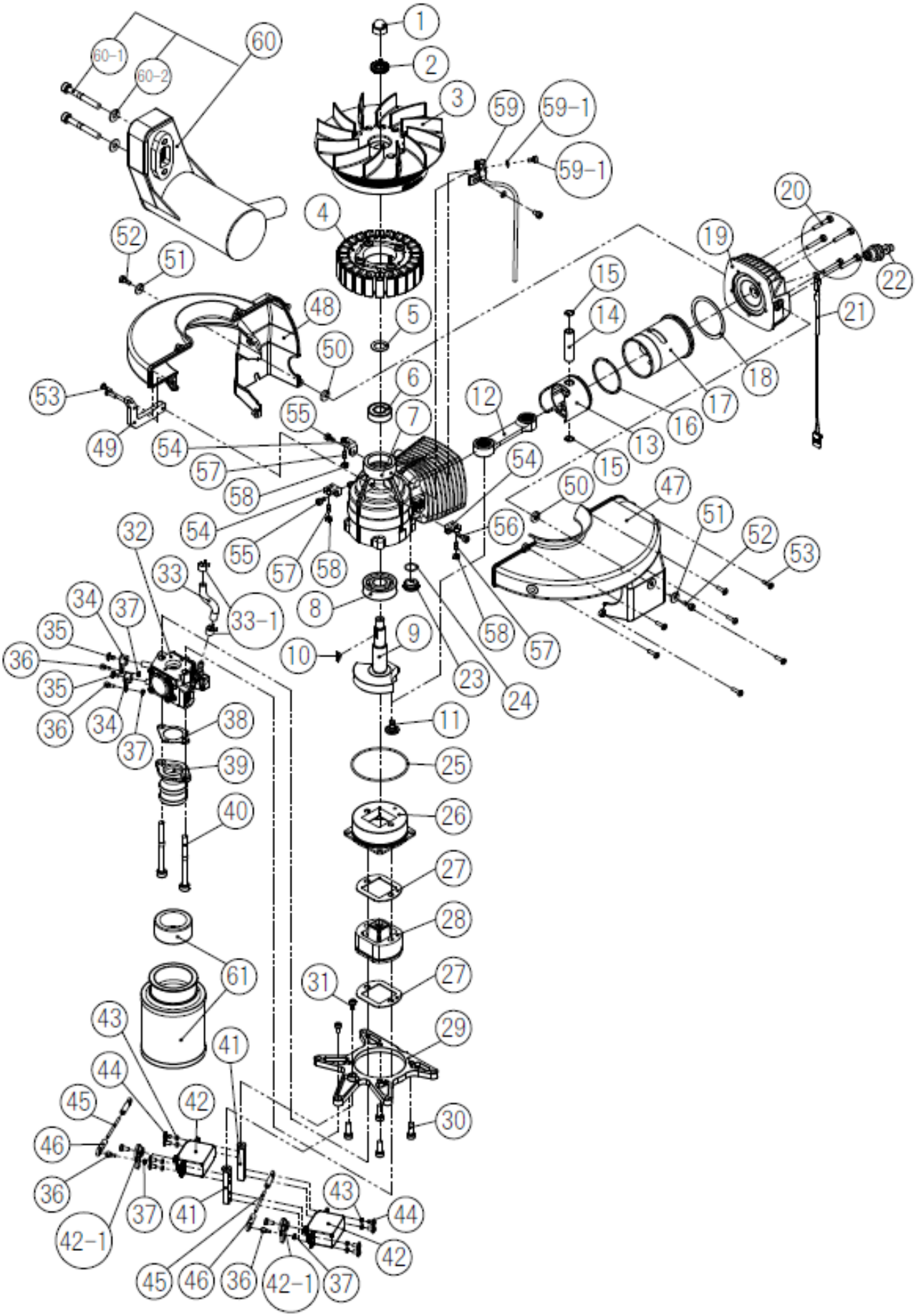


Fig. 13

29.PARTS LIST

No.	Code	名称	Name	備考/Note
1	4AP10000	袋ﾅｯﾄ 5/16	BOX NUT 5/16	締付トルク/Torque 30N･m
2	55500007	ﾉﾙﾄﾛｯｸﾜｯｼｬ M8 (10ｲﾘ)	NORD LOCK WASHER M8 (10PCS.)	
3	54076020	ﾛｰﾀｰ一式 SGM-9020-135	ROTOR ASSEMBLY SGM-9020-135	
4	54076010	ｽﾃｰﾀｰ一式 SGM-9020-135	STATOR ASSEMBLY SGM-9020-135	
5	46120000	ｽﾗｽﾄ ﾜｯｼｬ 91FX.SXH.SZ.FT160.FF	THRUST WASHER 46AX.91FX.SXH.SZ.FT160.FF	
6	26731010	ﾎﾞｰﾙ ﾍﾞｱﾘﾝｸﾞ(F) 120AX	BALL BEARING (F) 120AX	
7	4AP01000	ｸﾗﾝｸｹｰｽ GT33REU	CRANKCASE GT33REU	
8	4AH30000	ﾎﾞｰﾙ ﾍﾞｱﾘﾝｸﾞ(R) GT33REU	BALL BEARING (R) GT33REU	
9	4AP02000	ｸﾗﾝｸｼｬﾌﾄ GT33REU	CRANKSHAFT GT33REU	
10	29008219	ｳｯﾄﾞﾗﾌ ｷｰ 61.90.91	WOODRUFF KEY 61.90.91	
11	28302100	ｸﾗﾝｸ ﾋﾟﾝ ﾄﾒﾈｼﾞ GT33	CRANK PIN STOP SCREW GT33	締付トルク/Torque 1.5N･m 逆ねじ/ Reverse screw
12	28305000	ｺﾝﾛｯﾄﾞ GT33	CONNECTING ROD GT33	
13	28303200	ﾋﾟｽﾄﾝ GT33	PISTON GT33	
14	4A006000	ﾋﾟｽﾄﾝﾋﾟﾝ GF30	PISTON PIN GF30	
15	28317000	ﾋﾟｽﾄﾝﾋﾟﾝ ﾘﾃｲﾅｰ GT33.GT22.GF30	PISTON PIN RETAINER GT33.GT22.GF30	
16	28303400	ﾋﾟｽﾄﾝ ﾘﾝｸﾞ GT33	PISTON RING GT33	
17	28303100	ｼﾘﾝﾀﾞｰ ﾗｲﾅｰ GT33	CYLINDER LINER GT33	
18	28304160	ﾍｯﾄﾞｶﾞｽｹｯﾄ (0.4T) GT33	HEAD GASKET (0.4T) GT33	
19	4AP04000	ｼﾘﾝﾀﾞｰﾍｯﾄﾞ GT33REU	CYLINDER HEAD GT33REU	
20	79871200	ｷｬｯﾌﾟｽｸﾘｭｰ M3.0X20(10ｲﾘ)	HEXAGON HEAD SCREW M3.0X20(10PCS/SET)	締付トルク/Torque 1.7N･m
21	54065000	ST-01 EM-100 用温度ｾﾝｻｰ	ST-01 TEMP. SENSOR FOR EM-100	
22	71669000	ｽﾊﾟｰｸ ﾌﾟﾗｸﾞ CM-6(NGK)	SPARK PLUG CM-6(NGK)	
23	29701300	ｸﾗﾝｸｹｰｽ ﾌﾟﾗｸﾞ GT55.33.22.GF30	CRANKCASE PLUG GT55.33.22.GF30	締付トルク/Torque 1.2N･m
24	29701310	O-ﾘﾝｸﾞ(SS-10.5)	O-RING (SS-10.5)	
25	29122540	ｻｲﾚﾝｻｰ ｶﾞｽｹｯﾄ (O-ﾘﾝｸﾞ) E-5020	SILENCER GASKET (O-RING) E-5020	
26	4AP07000	ｶﾊﾞｰﾌﾟﾚｰﾄ GT33REU	COVER PLATE GT33REU	
27	28315000	ｷｬﾌﾞﾚﾀｰ&ﾘｰﾄﾞﾊﾞﾙﾌﾞ ｶﾞｽｹｯﾄ GT33	CARBURETTOR & REED VALVE GASKET GT33	
28	28316000	ﾘｰﾄﾞﾊﾞﾙﾌﾞ一式 GT33	REED VALVE ASSEMBLY GT33	
29	4AP51000	ﾗｼﾞｱﾙﾏｳﾝﾄ GT33REU	RADIAL MOUNT GT33REU	
30	79871415	ｷｬｯﾌﾟｽｸﾘｭｰ M4.0X15(10ｲﾘ)	HEXAGON HEAD SCREW M4.0X15(10PCS/SET)	締付トルク/Torque 3.6N･m
31	79871109	ｷｬｯﾌﾟｽｸﾘｭｰ M3.0X 6 (10ｲﾘ)	HEXAGON HEAD SCREW M3.0X 6 (10PCS/SET)	締付トルク/Torque 1.2N･m
32	28381000	ｷｬﾌﾞﾚﾀｰ ｽﾛｯﾄﾙ (WT1024) GT33	CARBURETTOR COMPLETE (WT1024) GT33	
33	28382500	ｶﾞｿﾘﾝ用燃料ﾁｭｰﾌﾞ ｲｴﾛｰ M	GASOLINE FUEL TUBE YELLOW M	
34	22081408	ｽﾛｯﾄﾙ ｱｰﾑ一式(NO.5)	THROTTLE LEVER (NO.5)	
35	29781350	WLA-2 N4-40X5 ﾈｼﾞ 96-156	WLA-2 SCREW 96-156	締付トルク/Torque 0.8N･m
36	4AA07060	ﾘﾝｹｰｼﾞﾎﾞｰﾙ M2X4 φ5X9 (10ｲﾘ)	LINKAGE BALL M2X4 5X9 (10PCS/SET)	締付トルク/Torque 0.15N･m
37	79850020	ﾅｯﾄ 2.0 X 0.40 (10ｲﾘ)	NUT 2.0 X 0.40 (10PCS/SET)	締付トルク/Torque 0.15N･m 中強度ねじ接着剤/LOCTITE242
38	29781500	ｷｬﾌﾞﾚﾀｰｶﾞｽｹｯﾄ GT55	CARBURETTOR GASKET GT55	
39	4AP50000	ｴｱｰｸﾘｰﾅｰｱﾀﾞﾌﾟﾀｰ GT33REU	AIR CLEANER ADAPTOR GT33REU	
40	79871560	ｷｬｯﾌﾟｽｸﾘｭｰ M5.0X60(10ｲﾘ)	HEXAGON HEAD SCREW M5.0X60(10PCS/SET)	締付トルク/Torque 3.6N･m
41	4AP52000	ｻｰﾎﾞﾏｳﾝﾄ GT33REU	SERVO MOUNT GT33REU	
42	4AP81201	ｽﾛｯﾄﾙ ｻｰﾎﾞ BLA1HD21	THROTTLE SERVO BLA1HD21	
42-1	4AP81210	ｻｰﾎﾞﾎｰﾝ BLA1HD21	THROTTLE SERVO HORN BLA1HD21	
43	4AG80600	ｻｰﾎﾞｶﾗｰ 3X4X1.6 (10ｲﾘ)	SERVO COLLAR 3X4X1.6 (10PCS/SET)	
44	79871730	ﾎﾞﾀﾝｷｬｯﾌﾟｽｸﾘｭｰ M3.0X6 (10ｲﾘ)	BUTTON HEX. HEAD SCREW M3.0X6 (10 PCS)	締付トルク/Torque 0.8N･m
45	4AP07010	ﾘﾝｸﾛｯﾄﾞ φ1.96XL35	LINK ROD 1.96XL35	
46	4AA07310	ﾎﾞｰﾙﾘﾝｸ 5.0 (5ｲﾘ)	BALL LINK 5.0 (5PCS/SET)	
47	4AP54000	ﾌｧﾝｼｭﾗｳﾄﾞ GT33REU L	FAN SHROUD L GT33REU	
48	4AP55000	ﾌｧﾝｼｭﾗｳﾄﾞ GT33REU R	FAN SHROUD R GT33REU	
49	4AP56000	ﾌｧﾝｼｭﾗｳﾄﾞｽﾃｲ GT33REU	FAN SHROUD STAY GT33REU	
50	79871750	樹脂ﾜｯｼｬ PEEK 3X10X2 (10ｲﾘ)	RESIN WASHER 3X10X2 (PEEK)(10PCS/SET)	
51	79871740	幅広平ﾜｯｼｬ 3X10X1 (10ｲﾘ)	WIDE WASHER 3X10X1(10PCS/SET)	
52	79871121	ｷｬｯﾌﾟｽｸﾘｭｰ M3.0X10 SUS (10ｲﾘ)	HEXAGON HEAD SCREW M3.0X10 SUS 10PCS/SET	締付トルク/Torque 1.5N･m
53	79871760	ﾅﾍﾞ+P ﾀｲﾄ 2.6X12 (10ｲﾘ)	P-HEAD SCREW 2.6X12(P-TITE)(10PCS/SET)	締付トルク/Torque 0.2N･m
54	4AH50040	ｽﾃｰﾀｰｽﾃｰ GT33U2	STATOR STAY GT33U2	
55	79871110	ｷｬｯﾌﾟｽｸﾘｭｰ M3.0X 8(10ｲﾘ)	HEXAGON HEAD SCREW M3.0X 8(10PCS/SET)	締付トルク/Torque 1.5N･m
56	79871140	ｷｬｯﾌﾟｽｸﾘｭｰ M3.0X12(10ｲﾘ)	HEXAGON HEAD SCREW M3.0X12(10PCS/SET)	締付トルク/Torque 1.5N･m
57	79871710	ｾｯﾄｽｸﾘｭｰ M3.0X10 (10ｲﾘ)	SET SCREW M3.0X10 (10PCS/SET)	中強度ねじ接着剤/LOCTITE242
58	79871720	ﾅｯﾄ 3.0 X 0.50 (10ｲﾘ)	NUT 3.0X 0.50(10PCS/SET)	締付トルク/Torque 1.2N･m
59	74002A20	回転ｾﾝｻｰ IG-10	ROTATION SENSOR IG-10	
59-1	74002321	ｶｲﾃﾝｾﾝｻｰ ﾄﾘﾂｹﾈｼﾞｾｯﾄ GT33.22.60	ROTATION SENSOR FIXING SCREW GT33.22.60	締付トルク/Torque 0.4N･m
60	28325001	ｻｲﾚﾝｻｰ E-5032 (GT33REU)	SILENCER E-5032 (GT33REU)	
60-1	79871545	ｷｬｯﾌﾟｽｸﾘｭｰ M5.0X45(10ｲﾘ)	HEXAGON HEAD SCREW M5.0X45(10PCS/SET)	締付トルク/Torque 7.2N･m
60-2	55500006	ﾉﾙﾄﾛｯｸﾜｯｼｬ M5 SP (10ｲﾘ)	NORD LOCK WASHER M5 SP (10PCS.)	

付属品/ACCESSORIES				
61	4AG81000	ｴｱｰｸﾘｰﾅｰ UNI (PK-4E)	AIR CLEANER UNI (PK-4E)	締付トルク/Torque 2.0N･m
—	54063000	ｽﾀｰﾀｰｼﾞｪﾈﾚｰﾀｰｺﾝﾄﾛｰﾗｰ SGC-1095HV	STARTER GENERATOR CONTROLLER SGC-1095HV	
—	74001041	EM-100(33REU) ｴﾝｼﾞﾝﾏﾈｼﾞﾒﾝﾄｼｽﾃﾑ	EM-100(33REU) ENGINE MANAGEMENT SYSTEM	
—	54060000	SV-01 EM-100 用電圧ｾﾝｻｰ	SV-01 VOLT. SENSOR FOR EM-100	
—	54067000	SC-01 EM-100 用電流ｾﾝｻｰ	SC-01 CURRENT. SENSOR FOR EM-100	
—	74002F10	ｲｸﾞﾅｲﾀｰ (IG-08A) GT33REU	IGNITION MODULE (IG-08A) GT33REU	
—	74001180	ﾚｷﾞｭﾚｰﾀｰ(OSP-120)	OSP-120 REGULATOR	

LIST 6

30. THREE-DEMENSIONAL DRAWING

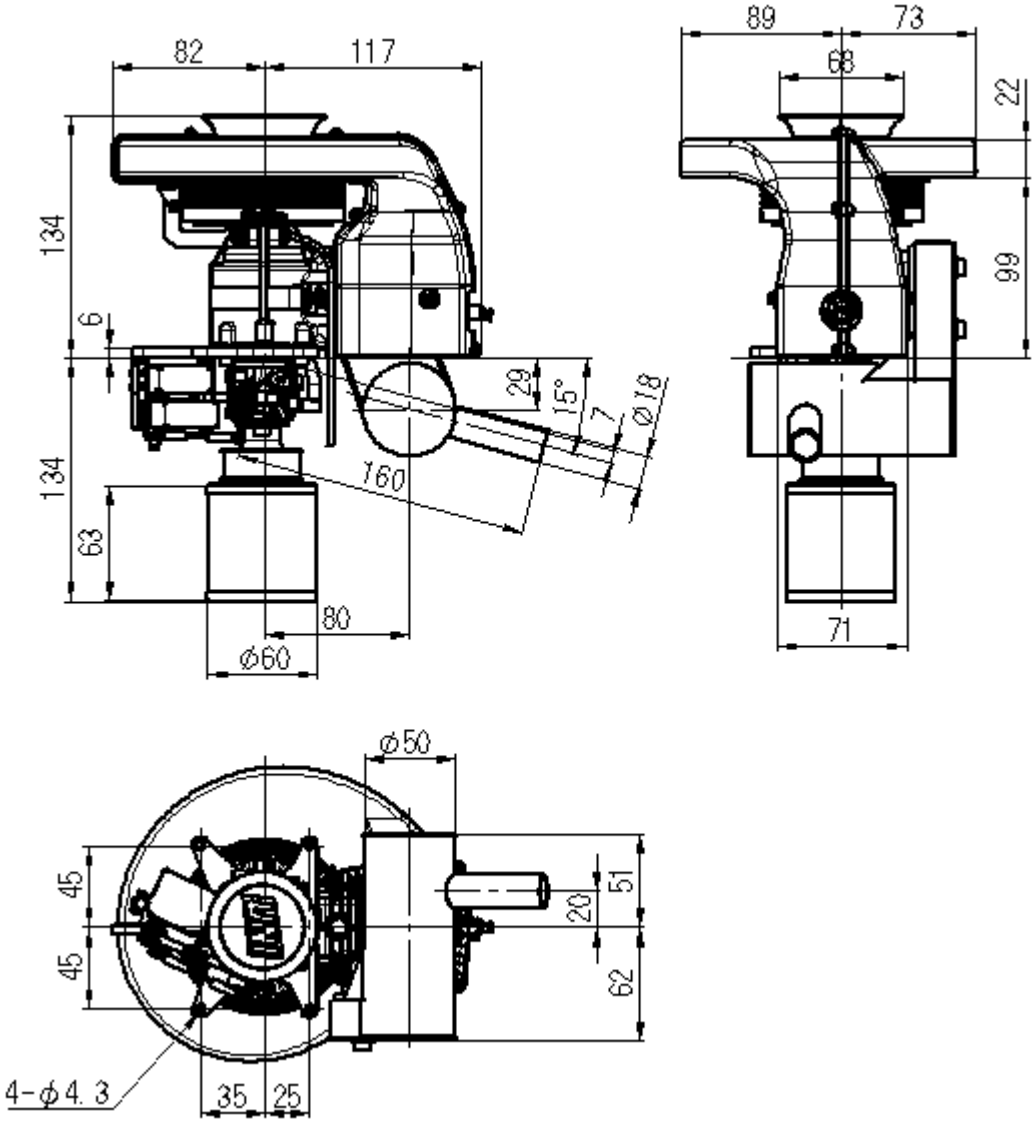


Fig. 14

31. WHEN YOU NEED TO REPAIR

Read the instruction first before sending it to us for repair. Contact to our customer center to get detail repair instruction.

Information we need

Send a letter of specific descriptions about trouble situation with your product.

- ●product the trouble situation
- ●the transmitter and receiver
- ●aircraft (name of aircraft, how to equip it to the aircaft)
- ●product code and quantity
- ●address, name, telephone number

Contact to the OS engine serves when you need repair or after services.

Telephone available time:9:00 ～ 12:00･13:00 ～ 17:00

O.S.ENGINES MFG.CO.,LTD.
6-15 3-Chome Imagawa Higashisumiyoshi-ku
Osaka 546-0003, Japan TEL. (06)6702-0225
http://www.os-engines.co.jp FAX. (06)6704-2722

O.S. PROFESSIONAL