2-stroke gasoline engine for UAV

GT120THU

Instruction manual
Ver1.02
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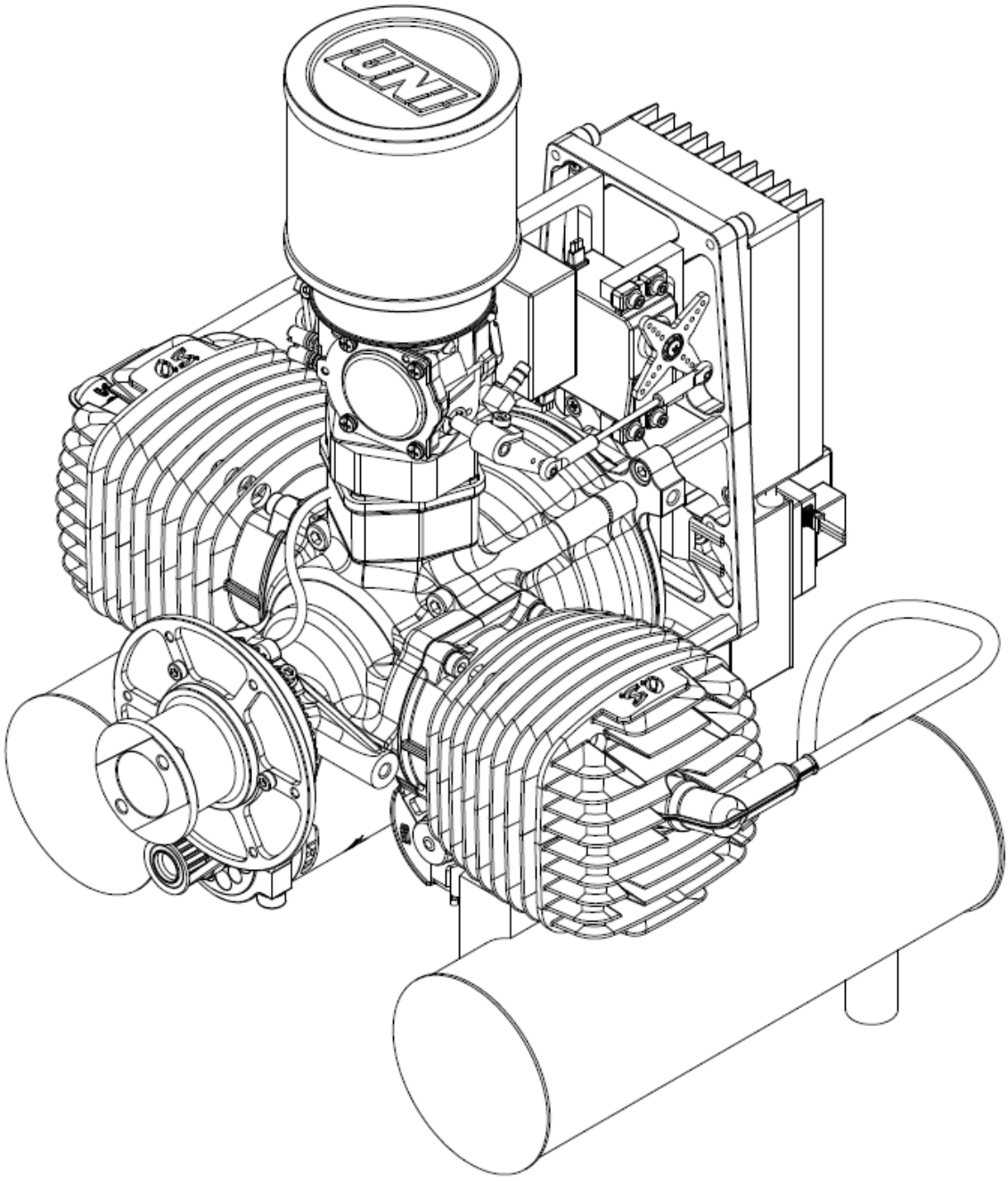

O.S. ENGINES MFG. CO., LTD.

CONTENTS

1. ABOUT THIS 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” (below) must be read first.

2. SAFETY INSTRUCTIONS AND WARNINGS

(1) The power of the engine is capable of harming 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 at 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.

ATTENTION- 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

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

②Gasoline is poisonous. Do not allow it comes into 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.

③Gasoline 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.

④Carry 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.

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

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

⑦Observe 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.

⑧Never operate your engine in an enclosed space. Model engines, like automobile engines, exhaust deadly carbon-monoxide. Run your engine only in an open area.

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

⑩When adjusting the output of regulate rectifier, make sure it match the voltage of power supplies, or it could bring a danger of fire.

⑪Do not charger the battery while the regulator rectifier is working since it could bring the danger of fire.

(4) NOTES

①This engine is designed for UAV aircrafts. Do not attempt to use it for any other purpose.

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

③ Be sure to use an effective silencer (muffler). Frequent exposure to an open exhaust may eventually impair your hearing. Such noise is also likely to cause annoyance to others over a wide area.

④ Mount the engine in the aircraft securely, following the manufacturers’ recommendations.

⑤ For people safety, keep all onlookers (especially small children) well back (at least 30 meters) when preparing the aircraft for flight.

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

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

⑧Take care that loose clothing (ties, shirt sleeves, scarves, etc.), do not come into contact with 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.

⑨Use an electric starter for the engine. To wear safety glasses is strongly recommended. If you try hand starting, be sure to use a safety stick or heavy glove. Never attempt to start the engine with a bare hand.

⑩Do not start the engine in an area containing loose gravel or sand. The propeller may throw such material in your face and eyes and cause injury.

⑪If you have to carry the aircraft to the take-off point with the engine running, be especially cautious. Keep the propeller pointed away from you and walk well clear of spectators.
⑫Turn off the ignitor switch to stop the engine or fully close the throttle valve via the transmitter to shut off the fuel supply. Otherwise there is a possibility of injury.
⑬Just after the engine stopped, the engine may start with a crank even the ignitor switch is off. Do not crank the engine, or there is a possibility of injury.
⑭Be sure to equip an on/off switch between the ignitor and a battery, which you can reach from outside the aircraft to stop the engine if it is started unintentionally with the transmitter turned off.
⑮The throttle linkage should be made as it can be remotely controlled to stop the engine in case of an unintentional start.

3. OVERVIEW OF GT120THU

(1) The engine is two-stroke gasoline engine designed for UAV aircrafts.
(2) The engine is equipped with an electric starter.
(3) The engine is equipped with a generator and a regulate rectifier to secure power supply (AC → DC rectification and voltage regulation) for a long flight
(4) The engine is equipped with a throttle servo, a choke servo, a starter switch, a regulate rectifier and an ignitor etc. onboard.
(5) The onboard generator OGA-200 of is a 3-phase alternating- current AC generator with an excellent cooling system.
(6) The regulate rectifier is equipped with an open regulate circuit for high efficiency. The output can be adjusted within 6V-30V.
(7) The engine runs counter-clockwise when viewed from the front. Consult us if you want to run it reverse rotation.
(8) This is an air-cooled engine. For keeping the engine always in an appropriate temperature condition, a fan, a shroud or other cooling system of your own are needed.
(9) The engine is only designed for UAV. Do not attempt to use it for any other purpose.

4. SPECIFICATIONS

(1) GT120THU engine

- ✧ Type : 2-stroke air - cooled engine
- ✧ Displacement : 119.82cc
- ✧ Bore × stroke : 44mm×39.4mm
- ✧ Output power : about 10ps(7.4kW)/7,500rpm
- ✧ Practical RPM range : 1,500～8,000rpm
- ✧ Weight : 5,620g (silencer & accessories included)
- ✧ Fuel : regular gasoline mixed with oil (gasoline：oil＝50：1)
- ✧ Carburetor : Diaphragm type/ Tillotson HS type
- ✧ Ignition method : battery CDI
- ✧ Ignition plug : CM-6 type
- ✧ Lubrication method : follow the lubrication instruction by the oil in the fuel
- ✧ Fuel consumption : about 100cc/min/7,000rpm(full load)
- ✧ Ideal condition : temperature -20～50℃、height 0～3,000m
- ✧ Durable time : over 500hrs (overhaul：every 100hrs)

(2)OGA-200 generator

- ✧ Type: Three-phase AC generator
- ✧ Back electromotive force constant: 1.43 mV / rpm
- ✧ Number of poles: 4 poles
- ✧ Rated voltage: 12 V
- ✧ Maximum current: 25 A (20 min)
- ✧ Rated current: 14 A
- ✧ Phase to phase resistance: 35 mΩ
- ✧ Gear ratio (GT 120 THU): 3.94: 1

(3)ORF-200 Regulated Rectifier

- ✧ Type: 3-phase AC open type Regulate Rectifier
- ✧ Maximum input voltage: 100 V (AC)
- ✧ Rated input voltage: 60 V (AC)
- ✧ Maximum output power: 200 W (10 min)
- ✧ Maximum output voltage: 28 V
- ✧ Minimum output voltage: 6 V
- ✧ Maximum output current: 16 A
- ✧ Rated output power: 140 W
- ✧ Rated output voltage: 12 V
- ✧ Rated output current: 12 A

5. NAME OF EACH PART

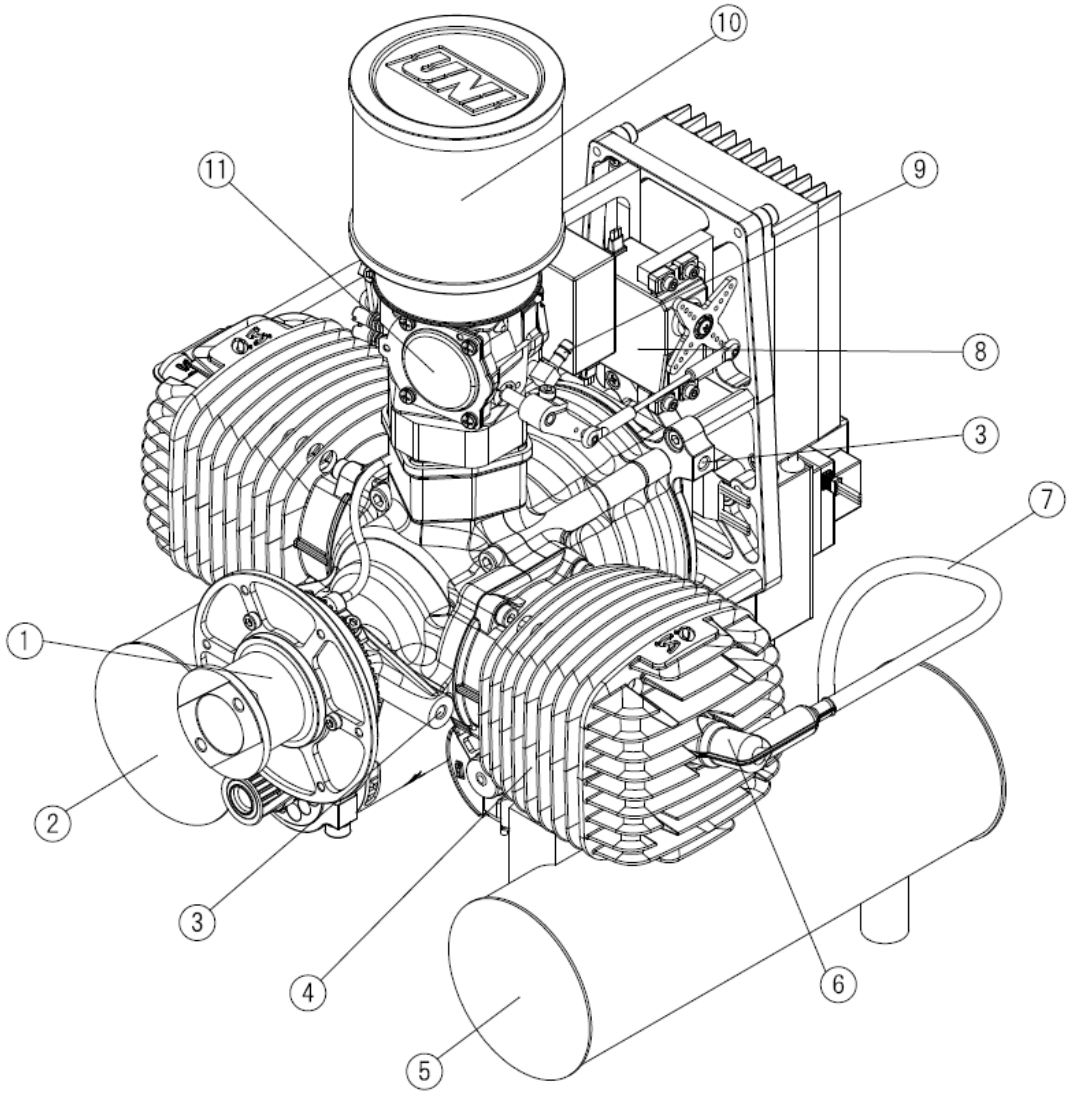

Fig 1

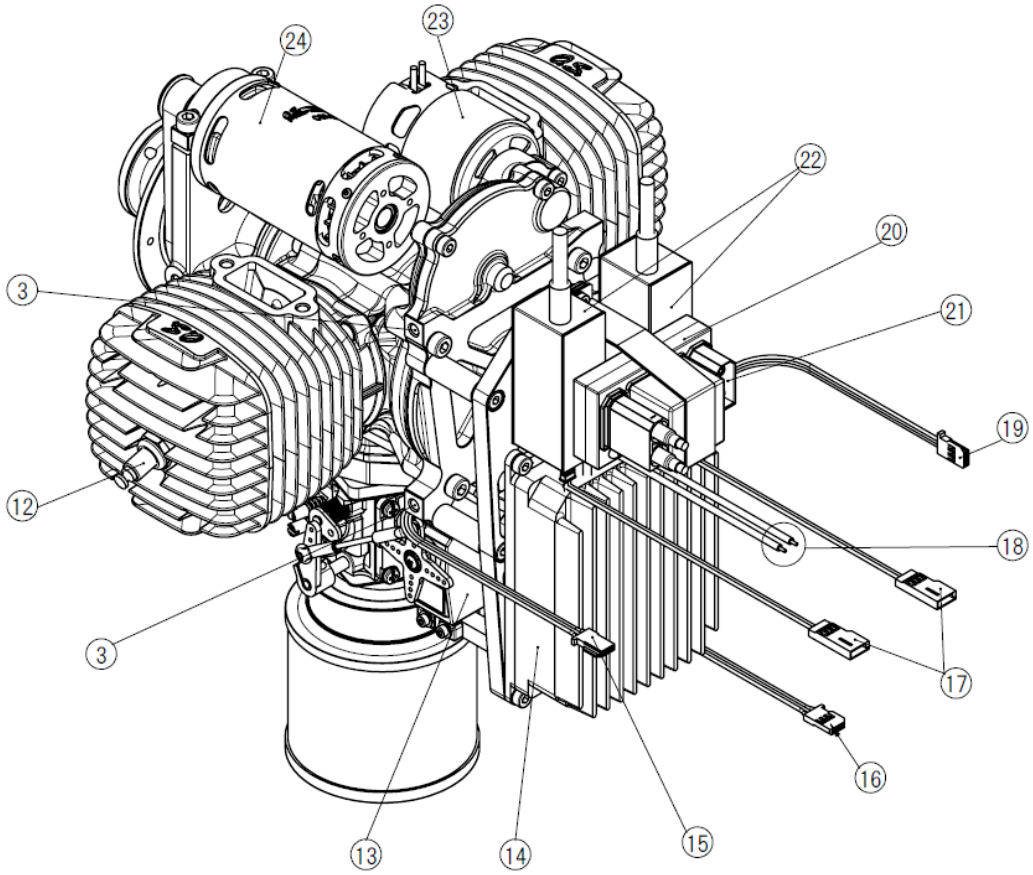

Fig 2.

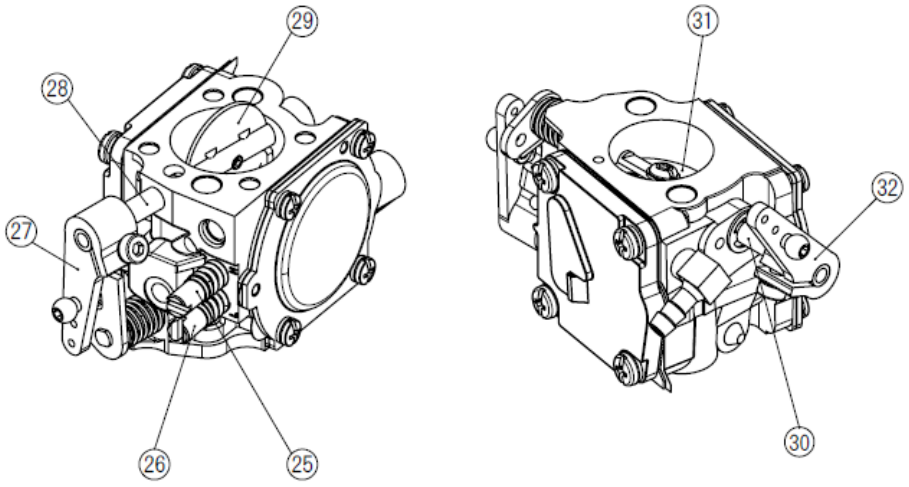

Fig 3.

№	名称	Name	備考/Note
1	ファンシャフト	Fan Shaft	
2	E-6030L サイレンサー	E-6030L Silencer	
3	取付けマウント	Mount	
4	シリンダーブロック	Cylinder block	
5	E-6030R サイレンサー	E-6030R Silencer	
6	プラグキャップ	Plug cap	
7	ハイテンションコード	High tension cord	
8	スロットルサーボ	Throttle servo	
9	燃料インレット	Fuel inlet	
10	エアクリーナー	Air cleaner	
11	キャブレター	Carburetor	
12	プラグ CM-6	Spark plug CM-6	
13	チョークサーボ	Choke servo	
14	ﾚｷﾞｭﾚｰﾄﾚｸﾃｨﾌｧｲｱ ORF-200	Regulator/Rectifier ORF-200	
15	チョークサーボコネクター	Choke servo connector	
16	スロットルサーボコネクター	Throttle servo connector	
17	イグナイター電源コネクター	Igniter power connector	
18	ﾚｷﾞｭﾚｰﾄﾚｸﾃｨﾌｧｲｱ出力リード	Reg/Rec power lead	
19	スタータースイッチコネクター	Starter switch connector	
20	スタータースイッチ	Starter switch	
21	スターター電源コネクター	Starter power connector	
22	イグナイター IG-11	Igniter IG-11	
23	スターターモーター	Starter motor	
24	発電機 OGA-200	Generator OGA-200	
25	ハイニードル	High end needle	
26	スローニードル	Slow end needle	
27	チョークアーム	Choke lever	
28	チョークシャフト	Choke shaft	
29	チョークバルブ	Choke valve	
30	スロットルシャフト	Throttle shaft	
31	スロットルバルブ	Throttle valve	
32	スロットルアーム	Throttle lever	

6. BATTERIES

(1) Throttle servo, choke servo and starter switch batteries
Power supply: 4.8V-8.4V
Use the radio control system (receiver) battery.

(2) Ignition battery (Attention)
Power supply: 6.0V-8.4V
Use an insulated power supply independent of the radio control system, starter and on-board equipment.

(3) Starter switch battery
Output power: 11.1～16.8V
Use the power supply, whose capacity of battery is 2,200mAh or more, the discharge power is 35C or more.

7. ABOUT THE REGULATE RECTIFIER

The factory setting of output voltage is 12V.
Refer to the ORF-200 regulate rectifier instruction to change the output voltage.
Not only does the output voltage concern with the electromotive capacity of generator, but also with the rotation per minute of the engine, which means there is a possibility that the output voltage may not reach

the set voltage. For example, at the situation setting output voltage is 12V, the generator speedup ratio of GT120THU is 3.94:1/ the counter electromotive force is 1.43 mV/ conversion efficiency is around 85%)≒2,500rpm.

So when it drops lower than 2,500rpm, the output voltage will decrease proportionately.

8. COOLING SYSTEM

The engine cylinder block has to be cooled down while running since it is air-cooled. Since the propeller, cooling fan and shroud are not provided with this engine. Prepare your own.

In case of making your own cooling system, the system is supposed to cool down the cylinder head temperature (CHT fig. 4) lower than 180℃ to make the engine work properly.

Fig. 4 shows the temperature measuring point.

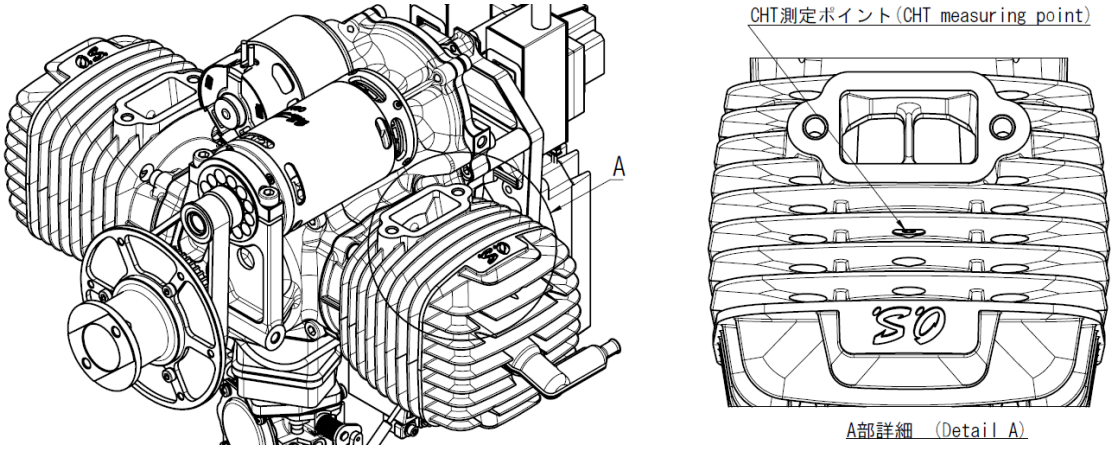

Fig.4

9. INSTALLATION

(1) Engine

Bolts for mounting it on the aircraft are not provided as accessories. Purchase 6 pieces by yourself. The strength level of the screws should be higher than 12.9, which can be used as cap screws. Also, the screws for meshing part with the engine are suggested to around 7-8mm (tightening torque 5.4 N・m).

(2) Silencer

Mount the silencer which is included in the accessories with M5X25 cap screw and nord-lock washer (tightening torque 7.2 N・m). Apply the liquid gasket which is gasoline resistant, on the joint surface to prevent oil leakage from it (ThreeBond TB1212).

(3) Air cleaner

Mount the air cleaner on the carburetor with the attached hose band (tightening torque 1.0 N・m).

10. FUEL TANK

(1) Fuel consumption of the engine is "100cc/min/7,000rpm (full load)" in this manual. Decide a fuel tank capacity according to it.

(2) Choose a gasoline resistant fuel tank. Do not use a fuel tank for glow engines because 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.

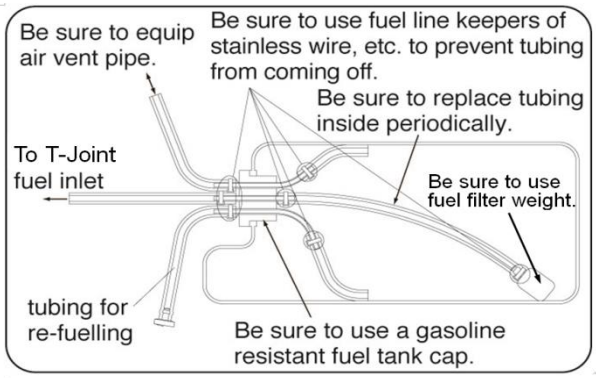

Fig.5

(4) Do not use muffler pressure from a fuel tank.

Make sure to have an air vent pipe for ventilation.

(5) Use the following tube for piping: Tygon® F-4040A, Fluoro rubber or Nitrile rubber (I.D. ϕ3.0～3.2mm,

O.D.ϕ6.0～6.4mm). 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.

(6) The fuel tank should have three separate tubes including one exclusively for refueling. Use ϕ0.6～0.8 mm the stainless steel wire clips to fix each of the tube.

11. FUEL TUBE

(1) Clip the joint part of each tube with ϕ0.6～0.8 stainless steel wire or hose accessory clips.

(2) Piping between the fuel tank and fuel filter, and the fuel and filter carburetor

① Use the fuel filter # 78300000 as shown in the Fig. 6, be sure of the direction since it is vital for the fuel filter.

② The length of the each tube should have a margin of 10mm in addition to the shortest connection distance.

③ Fix the tubes firmly not to be moved by flowing wind pressure, be careful not kink the tubes also.

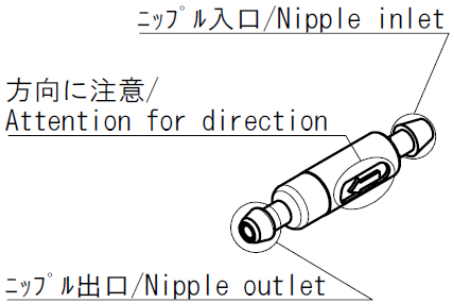

Fig 6.

12. WIRINGS

(1) Wirings of the throttle servo, the choke servo, and the starter switch

①Connect the throttle servo to the throttle channel of receiver and set the direction of servo arm movement, the fully open / close position (end point adjust) using functions of the transmitter.

②Connect the choke servo to an auxiliary (aux.) channel of the receiver and assign the channel to a 2 or 3 – position alternate toggle switch. Set the direction of servo arm movement, the fully open / close position (end point adjust) using functions of the transmitter.

③Connect the starter switch to an auxiliary (aux.) channel of the receiver and assign the channel to a 2-position momentary toggle switch. Set the direction of the switch, the fully open / close position (end point adjust) using functions of the transmitter. The starter switch determines on or off at the threshold of 1,500μs PWM signal, which is neutral position. So when you set the fully open / close position, 1,500μs PWM signal should be included in the range of turn on / off the 2-position momentary toggle switch.

(2) Wiring of starter switch battery

Charging the starter use the its equipped XT90 type concave connector, the voltage of starter battery is 11.1～16.8V, the capacity of it is needed to be over 2,200 mAh, use the more than 35C discharge capacity power supply to charge it.

Attention:

Do not run the starter for more than 3 seconds at a time. Give the starter at least 3-second interval for continual use. Otherwise the starter, lead wires and battery may get damaged.

(3) Wiring of regulate rectifier output

The output of regulate rectifier has two black lead wires and 14AWG wire which are pre-tinned without any connector. However, you can wire it yourself depends on the equipment or connector you are using.

13. FUEL AND OIL MIX

(1) Use regular gasoline. (No need to use high octane gasoline.)

(2) Alcohol based glow fuel cannot be used in this engine because it cannot make the engine work properly, and also the internal carburetor plastic parts will get damaged.

(3) Use high quality 2-stroke engine oil available on the market because some oil might accumulate carbon residues in the combustion chamber and the exhaust port after several-hour operation and cause a trouble. Check the combustion chamber if there is unusual residue in short period.

(4) 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. ZENOAH 2-strokes genuine oil FD (50:1), KLOTZ ModeLube® (50:1), Castrol Power 1 – TTS Racing (50:1). (This does not mean we guarantee the quality of these oils.)

(5) With a gasoline engine, passages in the carburetor are narrower than that of a glow engine, therefore it is very sensitive against foreign materials such as dust. It is suggested to use optional accessory Super Filter L (Code No.72403050) when filling a tank in a model from a container for transportation or storage.

14. BREAKING IN AT FIRST TIME

Breaking process on the bench is not necessary for this engine since the engine is broken in for 10 minutes at the factory before the shipment. But you need to keep in mind the several instructions as follows.

(1) Run the engine in rich adjustment during breaking in.
(2) Use the fuel at 25:1 mixture ratio with the oil you are using for actual operation.
(3) Break in the engine mounted in a aircraft with actual flying.
(4) The flying during breaking in is mainly hovering. Do not fly with additional payloads.

15. START-UP INSPECTION

Pre-operation inspections should be done as shown below.

GT120THUinspection before operation		
Items to be inspected	Inspection contents	Method
Engine installation	Check if the engine is mounted correctly and if there is no loose screws and bolts.	Visual
Silencer mounting	Check if the silencer is mounted correctly or there is a loose.	Visual
Air cleaner	Check if the air cleaner is firmly fixed and if there is foreign material on it.	Visual
Propeller, clutch, cooling fan	Check if the propeller, clutch, cooling fan are mounted correctly and there is no loose screws and bolts.	Visual
Exhaust pipe	Check the exhaust pipe if there is foreign material in it.	Visual
Cooling air passage	Check the air inlet/outlet if there is foreign material.	Visual
Plug cap	Check the plug cap if it is fixed firmly to the spark plug.	Visual
Ignitor high tension cord	Check if there is wear and tear out, or dirt on it.	Visual
Fuel tubes	Check if tubes are frayed, kinked.	Visual
	Check if tube clips are fit firmly.	Visual
Electric wirings	Check if there is no cut, wear, and dirt.	Visual
	Check if all connectors are firmly connected.	Visual
Oil leakage	Check if there is oil leakage from an engine.	Visual
Linkage	Check if rod ends and link rods are firmly connected.	Visual
	Check if servo horns and servos are firmly fixed with screws	Visual
Remaining fuel	Check if the fuel tank is full.	Visual
Mixture oil	Check if gasoline and oil are mixed at correct rate.	Visual

16. HOW TO START THE ENGINE

(1) Inducing the fuel
① Turn on the transmitter.
② Turn on the receiver switch.
③ Turn off the ignitor switch.
④Close the choke valves of engine.
⑤ Open the throttle valve by 10 degrees from the fully closed position (the first idling position).
⑥ Use a starter to run it until the fuel coming through the inlet of carburetor.

Attention:
Do not run the starter for more than 3 seconds at a time. Give the starter at least 3-second interval for continual use. Otherwise the starter, lead wires and battery may get damaged.

(2) Choke
① Turn on the transmitter.
② Turn on the receiver switch.
③ Turn on the ignitor switch.
④ Close all choke valves of engine.
⑤ Open the valve by 10 degrees from the fully closed position (the first idling position)
⑥ Use the starter until the engine fires or “pop” (see the NOTE below)
⑦ Open the choke valve fully.

NOTE: Listen to the firing or popping sound carefully when you are using the starter to start the engine. The sound is supposed to hear after using the starter for a few seconds. In case you cannot listen to the sound, check the above article 9 – 12 again for the initial installation, or check if the article 16. (1) – (2) is set up correctly. Then go to next step if everything is all right.

(3) Start the engine
① Turn on the transmitter.
② Turn on the receiver switch.
③ Open the choke valves.
④ Open the throttle valve by 10 degrees from the fully closed position (the first idling position).
⑤ Turn on the ignitor switch.
⑥ Inform your assistant or people around you that you are starting the engine.
⑦ Use a starter. Check the above article (2)-(3) procedures above again if it can’t get started for more than 3 seconds using the starter.

Warning:
Start it over than the position of fast idling might cause abnormal extra-output which could make propellers or rotor move extremely fast. There is a possibility to damage yourself or things.
Attention:
Do not run the starter for more than 3 seconds at a time. Give the starter at least 3-second interval for continual use. Otherwise the starter, lead wires and battery may get damaged.

(4) Countermeasures when the engine doesn’t start.
Possible reason:
Over rich (over choke) / over lean (not enough choking) the fuel mixture/incorrect throttle opening setting / the ignition setting up is not done completely (for example, ignition switch is off) .
Follow procedures below:
① Check the power supply to make sure the switch is on / battery is charged/ wires are not got damaged/ connectors are properly connected etc.
② Check and make sure if the throttle valve is at the first idling position- not only the position of transmitter throttle stick/ but also the position of fully opened throttle servo/ fully closed limit position (end point adjustment)/ the direction of throttle servo movement (NORMAL⇔REVERSE).
③ Check and make sure if it is not over choke- Remove the spark plug and check if the center and ground electrodes get wet with gasoline.
If it does, it is over choke, follow instruction below
1. Turn off the ignition switch.
2. Remove the spark plug and the plug cap.
3. Fully open the chock valve.
4. Full open the choke valve.
5. Use the starter around 10 seconds.
6. Dry the electrodes of the spark plug by a blower, or wipe the gasoline on them with a cloth.
7. Put the plug procedures on the engine and fit the plug cap on it.
8. Repeat the above procedures (2)-(3).

④If the electrodes of spark plug are not moist or the exhaust port does not smell gasoline, there is not enough choking. In case choking is still not enough even if you have repeated the procedures 16. (2) – (4) ②, the trouble may come from malfunction of the system rather than the problem of operation. Check the article 10 – 11 above, check if the fuel filter is not clogged as well.

17. 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 100℃. So warming up is needed when CHT is low by increasing the rpm of idling (700 – 800 more than usual) and refraining from moving the throttle stick quickly. In case you need quick warming up, increase the rpm of idling up to 3,000 – 4,000rpm, so that CHT raises more than 100℃ within several tens of seconds.

18. THE ADJUSTMENT OF CARBURETOR

(1) The range of adjustment by the slow needle and the high needle

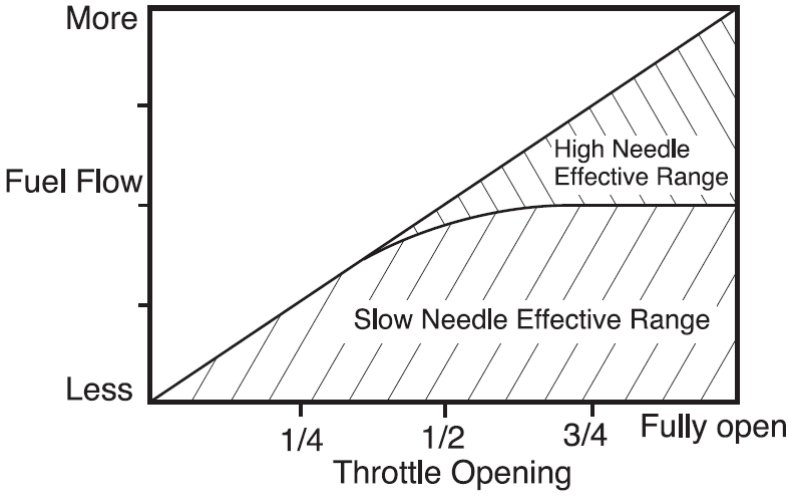

Fig 7

Fig.7 shows the adjustment ranges. The slow needle affects even full throttle range and the high needle affects 1/4 throttle opening. The slow needle and the high needle affect each other in a wide range generally for gasoline engine carburetors, so both needles need to be adjusted in the range of hovering.

(2) Adjustment during taking off

When the engine is started and has stable idling, move up the throttle stick gradually for taking off.

①In case the engine "stutters" or "coughs" and hesitates to increase rpm without much power, the slow needle is too rich. Turn in /clockwise the needle by 15 degrees and try taking off. Repeat the procedure until you can take off the aircraft.

②In case rpm does not increase with sluggish acceleration, and the engine dies quickly, the fuel mixture is lean. Turn the slow needle out/counter-clockwise by to richen the fuel mixture.

(3) Adjustment during hovering

Count the rpm of main rotor during hovering.

①In case the rpm of main rotor is higher than you desire, set the throttle curve lower and turn the slow needle out/counter-clockwise by 30 degrees to richen the fuel mixture.

②In case the rpm of main rotor is lower than you desire and you lose altitude of the hovering aircraft, probably the slow needle is set rich. Turn the slow needle out/counter-clockwise by 15 degrees to lean the fuel mixture.

(4) Adjustment in flight

Basic engine adjustment during actual flight after breaking in

① Turn out/counter-clockwise the high needle by 30 degrees from the factory setting to check if it affects hovering.

② Change the hovering mode to flight mode to fly around and check the engine performance in flight. Losing power at full throttle, engine stall, over rev at lower rotor pitch are symptoms of lean needle adjustment. When the needle adjustment is lean, the engine loses power and stalls abruptly. Start from rich adjustment and lean the adjustment gradually.

③The engine gets overloaded and overheats even the slow and high needles are adjusted a little rich when the main rotor maximum pitch is too high. Also, the engine overheats when it over-revved at low rotor pitch.

Note 1: The engine outputs 70 – 80% power at a half throttle position. Adjust the throttle stick position of transmitter at around neutral for hovering using throttle curve and pitch curve setting functions.
Note 2: The needle adjustment of the engine in aircraft is closely related to the adjustment of throttle curve, pitch curve, and governor functions of transmitter. So the total combination of these adjustments is important.
Note 3: Applying spark plug ignition system to the engine, you can see rich adjustment symptoms relatively easily and the engine hardly stalls because of stable ignition timing, on the contrary, it is hard to notice lean adjustment and the engine sometimes stalls and overheats, so always start the adjustment with the needles on rich side.

19. INSPECTIONS BEFORE FLIGHT

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

GT120THU inspection contents		
items	contents	Inspection Method
idling	Check if the engine runs stable at idling.	hearing/ using tachometer
response	Move the throttle stick up and down during hovering to see if the aircraft responses and if the speed of engine goes up and down.	Visual /hearing inspection
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 work correctly when the engine is running. (do the distance test and also see if it is working normally during pirouetting)	visual inspection

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

20. FLIGHT

(1) Be prepared for unexpected troubles such as engine stall during flight.
(2) Using the engine management system 'EM-100', which is sold as an option by us, is recommended for monitoring the engine speed, temperature, fuel level, the power supply voltage of igniter by the telemetry function during flight.

(3) Cooling is more vitally important to gasoline engines than to a glow engines. If overheating symptoms (loss of power at full throttle or the stick position of throttle goes up when hovering) are observed during flight, immediately stop flying and carry out the following measures.

① Adjust the slow needle and high needle to make the air/fuel mixture as rich as possible within the range you can continue flying.
② Set the throttle curve or pitch curve to make the overall engine rpm going up.
③ Prevent the air leakage from a cooling shroud if the engine is equipped with it.
④ Enlarge the cooling fan size.

(4) When an interval between two flights is short and the engine is still hot, although the overheating symptoms could not be observed right after the first flight, the high temperature created by the former flight can be transmitted all over the engine before the next flight, so the engine might show overheating symptoms during the next flight. In this case, leave the engine until it is fully cooled down (in hot weather, it may take more than one hour.) or run the engine for 4 to 5 minutes at idling.

21. INSPECTIONS AND TIGHTENING SCREWS AFTER THE FIRST FLIGHT

Check the following after the first flight of mounting the engine in an aircraft
(1) Tighten the screws of silencer again

The silencer nuts and screws loosen due to the heat and vibration created by the flight, tighten them again after the first flight following the instruction of 9.(2) silencer installation.

(2) Tighten the engine mounting screws

Tighten the engine mounting screws following the instruction 9. (1) Engine installation

(3) Check each part of aircraft again

The parts of aircraft would loosen due to the heat or vibration created by the engine during flight, check them again to make sure every part has been tighten following the aircraft instruction.

22. OPERATION LOG

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

23. PERIODICAL INSPECTION AND MAINTENANCE（Refer to the maintenance manual）

(1) Inspection after 25-hour operation

- Propeller
- Fuel tubes
- Fuel filter
- Plug cap & high tension cord
- Spark plug
- Throttle linkage
- Throttle servo
- Various fixing screws
- Various 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.

- Remove carbon in a combustion chamber
- Adjust the tension of the generator pulley belt
- Inspect Regulator Rectifier
- Inspect the 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.

- Every spare part of the engine
- Replace the fuel filter
- Replace the throttle servo
- Replace the fuel tube in the tank

24. AFTER-SALES SERVICE

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

25. EXPLODED VIEW

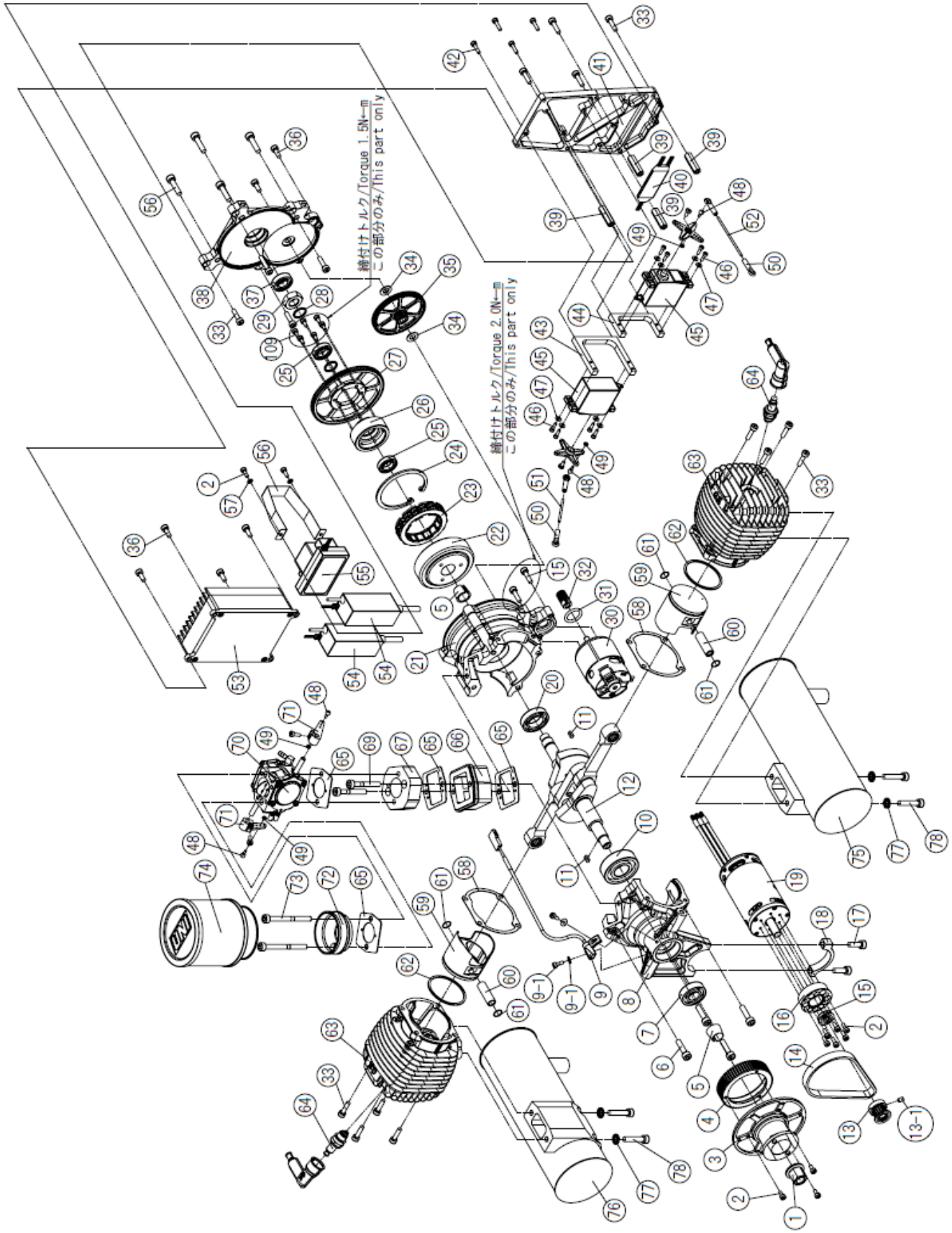

FIG.8

26. PARTS LIST

№	Code	名称	Name	Note
1	79850100	ﾅｯﾄ M10X1.0	M10X1.0	Tightening Torque 44N･m
2	79871109	ｷｬｯﾌﾟｽｸﾘｭｰ M3X6(10 ｲﾘ)	CAP SCREW M3X6(10/SET)	Torque 1.1N･m
3	4AA08000	ﾌｧﾝｼｬﾌﾄ	FAN SHAF	
4	4AA70010	ﾄﾞﾗｲﾌﾞﾌﾟｰﾘ 3G63	DRIVE PULLEY 3G63	
5	29708100	ﾃｰﾊﾟｰｺﾚｯﾄ	TAPER COLLET	
6	79871520	ｷｬｯﾌﾟｽｸﾘｭｰ M5X20(10 ｲﾘ)	CAP SCREW M5X20(10/SET)	Torque 7.2N･m
7	29332000	ﾎﾞｰﾙ ﾍﾞｱﾘﾝｸﾞ(F)	BALL BEARING (F)	
8	4AA01000	ﾌﾛﾝﾄｹｰｽ	FRONT CASE	
9	74002320	回転ｾﾝｻｰ	ROTATION SENSOR	
9-1	74002321	ｾﾝｻｰ ﾄﾘｯｹﾈｼﾞｾｯﾄ(2 ｲﾘ)	SENSOR SCREW SET(2/SET)	Torque 0.4N･m
10	28631000	ﾎﾞｰﾙ ﾍﾞｱﾘﾝｸﾞ(M)	BALL BEARING (M)	
11	29708200	ﾍｲｺｳ ｷｰ	PARAREL KEY	
12	4AA02000	ｸﾗﾝｸｼｬﾌﾄ一式	CRANKSHAFT ASSY	
13	4AA07020	ﾄﾞﾘﾌﾞﾝﾌﾟｰﾘ 3G16	DRIVEN PULLEY 3G16	
13-1	79820406	ｾｯﾄｽｸﾘｭｰ M4X6(10 ｲﾘ)	SET SCREW M4X6(10/SET)	Torque 1.5N･m
14	4AA07050	ﾍﾞﾙﾄ 3GT-255-10	BELT 3GT-255-10	
15	4AA32000	ﾎﾞｰﾙ ﾍﾞｱﾘﾝｸﾞ(ｼﾞｪﾈﾚｰﾀ)	BALL BEARING(GENERATOR)	
16	54059001	ｼﾞｪﾈﾚｰﾀｱﾀﾞﾌﾟﾀ-	GENERATOR ADAPTER	
17	79871515	ｷｬｯﾌﾟｽｸﾘｭｰ M5X15(10 ｲﾘ)	CAP SCREW M5X15(10/SET)	Torque 5.4N･m
18	4AA07040	ｼﾞｪﾈﾚｰﾀﾎﾙﾀﾞ-	GENERATOR HOLDER	
19	54053000	ｼﾞｪﾈﾚｰﾀｰ OGA-200	GENERATOR OGA-200	
20	27130020	ﾎﾞｰﾙ ﾍﾞｱﾘﾝｸﾞ(R)	BALL BEARING(R)	
21	4AA01800	ﾘｱｹｰｽ	REAR CASE	
22	4AA07070	ﾜﾝｳｪｲﾎﾙﾀﾞ-ｱｳﾀｰ	ONE WAY HOLDER OUTER	
23	4AA07080	ﾜﾝｳｪｲｸﾗｯﾁ	ONE WAY CLUTCH	
24	4AA07090	ﾜﾝｳｪｲﾘﾃｰﾅｰ(RTW-55)	ONE WAY RETAINER(RTW-55)	
25	4AA07110	ﾎﾞｰﾙ ﾍﾞｱﾘﾝｸﾞ(ﾜﾝｳｪｲ)	BALL BEARING(ONE WAY)	
26	4AA07100	ﾜﾝｳｪｲﾎﾙﾀﾞ- ｲﾝﾅｰ	ONE WAY HOLDER INNER	
27	4AA07130	ｽﾀｰﾀｰｽﾊﾟｰｷﾞｱ	STARTER SPUR GEAR	
28	4AA07120	ｼﾑﾘﾝｸﾞ 12X16X1	SIM RING 12X16X1	
29	79850121	ﾅｯﾄ M12X1.75LH	NUT M12X1.75LH	Torque 44N･m
30	4AA07140	ｽﾀｰﾀ-ﾓｰﾀ-	STARTER MOTOR	
31	4AA07410	O-ﾘﾝｸﾞ (P15-FKM)	O-RING (P15-FKM)	
32	4AA07190	ｽﾀｰﾀｰﾋﾟﾆｵﾝｷﾞｱ	STARTER PINION GEAR	

33	79871415	ｷｬｯﾌﾟｽｸﾘｭｰ M4X15(10 ｲﾘ)	CAP SCREW M4X15(10/SET)	Torque 3.6N･m
34	79872060	平ﾜｯｼｬ 6.0(10 ｲﾘ)	WASHER 6.0(10/SET)	
35	4AA07210	ｽﾀｰﾀｰﾐﾄﾞﾙｷﾞｱ	STARTER MIDDLE GEAR	
36	79871410	ｷｬｯﾌﾟｽｸﾘｭｰ M4X10(10 ｲﾘ)	CAP SCREW M4X10(10/SET)	Torque 2.7N･m
37	4AA07240	ﾎﾞｰﾙ ﾍﾞｱﾘﾝｸﾞ(ｶﾊﾞｰ)	BALL BEARING(COVER)	
38	4AA07250	ﾘｱｶﾊﾞｰ	REAR CAVER	
39	4AA07270	ﾃﾞﾊﾞｲｽﾌﾟﾚｰﾄｽﾃｰ	DEVICE PLATE STAY	
40	4AA07400	ｼﾝｺﾞｳﾌﾞﾝｷｭﾆｯﾄ SDU-01	SIGNAL DISTRIBUTOR SDU-01	
41	4AA07260	ﾃﾞﾊﾞｲｽﾌﾟﾚｰﾄ	DEVICE PLATE	
42	79871140	ｷｬｯﾌﾟｽｸﾘｭｰ M3X12(10 ｲﾘ)	CAP SCREW M3X12(10/SET)	Torque 1.1N･m
43	4AA07290	ｻｰﾎﾞﾏｳﾝﾄ L	SERVO MOUNT L	
44	4AA07280	ｻｰﾎﾞﾏｳﾝﾄ S	SERVO MOUNT S	
45	4AA07300	ｻｰﾎﾞ BLA1HF	SERVO BLA1HF	
46	79871030	ｷｬｯﾌﾟｽｸﾘｭｰ M2.6X10(10 ｲﾘ)	CAP SCREW M2.6X12(10/SET)	Torque 0.18N･m、LOCTITE 222 使用
47	79872026	平ﾜｯｼｬ 2.6(10 ｲﾘ)	WASHER 2.6(10/SET)	
48	4AA07060	ﾘﾝｹｰｼﾞﾎﾞｰﾙ	LINKAGE BALL	
49	79850020	ﾅｯﾄ M2X0.4(10 ｲﾘ)	NUT M2X0.4(10/SET)	
50	4AA07310	ﾎﾞ-ﾙﾘﾝｸ	BOLL LINK	
51	4AA07330	ﾘﾝｸﾛｯﾄﾞ L39.5	LINK ROD L39.5	
52	4AA07320	ﾘﾝｸﾛｯﾄﾞ L48	LINK ROD L48	
53	54055000	ﾚｷﾞｭﾚｰﾄﾚｸﾃｨﾌｧｲｱ ORF-200	REGULATE RECTIFIER ORF-200	
54	74002D00	ｲｸﾞﾅｲﾀｰ IG-11	IGNITION MODULE IG-11	
55	4AA07340	ｽﾀｰﾀｰｽｲｯﾁ SSW-100	STARTER SWITCH SSW-100	
56	4AA07350	ﾃﾞﾊﾞｲｽﾊﾞﾝﾄﾞ	DEVICE BAND	
57	79872030	平ﾜｯｼｬ 3.0(10 ｲﾘ)	WASHER 3.0(10/SET)	
58	28614000	ｼﾘﾝﾀﾞｰ ｶﾞｽｹｯﾄ	CYLINDER GASKET	
59	4AA03200	ﾋﾟｽﾄﾝ	PISTON	
60	29706000	ﾋﾟｽﾄﾝ ﾋﾟﾝ	PISTON PIN	
61	29317000	ﾋﾟｽﾄﾝﾋﾟﾝ ﾘﾃｲﾅｰ(2 ｲﾘ)	PISTON PIN RETAINER(2/SET)	
62	4AA03400	ﾋﾟｽﾄﾝ ﾘﾝｸﾞ	PISTON RING	
63	4AA03100	ｼﾘﾝﾀﾞｰﾌﾞﾛｯｸ	CYLINDER BLOCK	
64	71669000	ｽﾊﾟｰｸ ﾌﾟﾗｸﾞ CM-6	SPARK PLUG CM-6	
65	4AA15000	ｷｬﾌﾞ及びﾘｰﾄﾞｶﾞｽｹｯﾄ ｾｯﾄ	CAB.& REED GASKET SET	
66	4AB18000	ﾘｰﾄﾞﾊﾞﾙﾌﾞ	REED VALVE	
67	4AA82000	ｷｬﾌﾞﾚﾀｰｲﾝｼｭﾚｰﾀｰ	CARBURETOR INSULATOR	
68	4AB82000	ﾘﾍﾟｱｷｯﾄ HS-324A	REPAIR KIT HS-324A	
69	79871540	ｷｬｯﾌﾟｽｸﾘｭｰ M5X40(10 ｲﾘ)	CAP SCREW M5X40(10/SET)	Torque 4.0N･m
70	4AB81000	ｷｬﾌﾞﾚﾀｰ HS-324A	CARBURETOR HS-324A	

71	4AB81410	ｽﾛｯﾄﾙｱｰﾑ	THROTTLE LEVER	
72	4AA83000	ｴｱｸﾘｰﾅｰｱﾀﾞﾌﾟﾀ-	AIR CLEANER ADAPTER	
73	79871555	ｷｬｯﾌﾟｽｸﾘｭｰ M5X55(10 ｲﾘ)	CAP SCREW M5X55(10/SET)	Torque 5.4N･m
74	4AA84000	ｴｱｸﾘｰﾅ- PK-7E	AIR CLEANER PK-7E	
付属品/ACCESSORIES				
—	78300000	ｶﾞｿﾘﾝ用燃料ﾌｨﾙﾀｰ S	GASOLINE FUEL FILTER S	
—	70000001	ﾎｰｽｸﾘｯﾌﾟ φ6 (5 ｲﾘ)	HOSE CLIP 6 (5PCS/SET)	
オプション/OPTION				
75	4AA07390	ｻｲﾚﾝｻｰ E-6030R	SILENCER E-6030R	
76	4AA07380	ｻｲﾚﾝｻｰ E-6030L	SILENCER E-6030L	
77	55500006	ﾉﾙﾄﾛｯｸﾜｯｼｬ M5SP(10 ｲﾘ)	NORDLOCK WASHERS M5SP(10/SET)	
78	79871525	ｷｬｯﾌﾟｽｸﾘｭｰ M5X25(10 ｲﾘ)	CAP SCREW M5X25(10/SET)	Torque 7.2N･m

27. 3-DEMENSIONAL DRAWING (unit : mm)