



**Great Power Engine**

# **INSTRUCTION MANUAL**



[www.gpengine.world](http://www.gpengine.world)

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**PLEASE READ THESE INSTRUCTIONS CAREFULLY AND  
COMPLETELY BEFORE OPERATING THE ENGINE**

## TECHNICAL SPECIFICATIONS

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### Single-Cylinder

#### GP38

Bore	38 mm	RPM Range	
Net Weight		Output	
Ignition Weight	136 g	Fuel	
Muffler Weight	100	Lubrication	

#### GP61

Bore	46.5 mm	RPM Range	1600-8900 RPM
Net Weight	1440 g	Output	6.5 Horsepower
Ignition Weight	136 g	Fuel	Unleaded 89-93 Octane Fuel
Muffler Weight	160 g	Lubrication	40:1 Mixture of Octane Fuel and Synthetic Oil

#### GP88 V2

Bore	53 mm	RPM Range	1200-8500 RPM
Net Weight	1980 g	Output	10 Horsepower
Ignition Weight	136 g	Fuel	Unleaded 89-93 Octane Fuel
Muffler Weight	345 g	Lubrication	40:1 Mixture of Octane Fuel and Synthetic Oil

### Twin-Cylinder

#### GP76

Bore	38 mm	RPM Range	1400-9000 RPM
Net Weight	1720 g	Output	8 Horsepower
Ignition Weight	202 g	Fuel	Unleaded 89-92 Octane Fuel

Muffler Weight	200 g	Lubrication	40:1 Mixture of Octane Fuel and Synthetic Oil
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## GP123 V2

Bore	46.5 mm	RPM Range	1500-8900 RPM
Net Weight	2300 g	Output	12 Horsepower
Ignition Weight	202 g	Fuel	Unleaded 89-93 Octane Fuel
Muffler Weight	330 g	Lubrication	40:1 Mixture of Octane Fuel and Synthetic Oil

## GP178

Bore	53 mm	RPM Range	1100-9000 RPM
Net Weight	3550 g	Output	21.5 Horsepower
Ignition Weight	202 g	Fuel	Unleaded 89-92 Octane Fuel
Muffler Weight	430 g	Lubrication	40:1 Mixture of Octane Fuel and Synthetic Oil

# SAFETY INSTRUCTIONS

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## WARNING

It is vital to follow these safety instructions in order to prevent misuse of this engine that could result in severe harm to yourself or others. Great Power Engine Company does not take any responsibility for loss, damage, injury and/or death. In no event shall Great Power Engine Company be liable to the customers for special, incidental or consequential damages and injuries (including damages or loss of the third parties' properties or lives.) You are responsible for operating the engine safely. Please note that engines may stop suddenly for various reasons. Take this into account when flying your plane to prevent it being damaged in the event of a sudden stop.

1. By operating the engine, you agree to be held completely responsible for any damage or injury that is incurred as a result.
2. Read all instructions before operating the engine.
3. When operating the engine, always abide by the laws of your country.
4. Use original spare parts only.
5. Make sure all parts of your body clear of the spinning propeller of the plane.
6. Make sure all propeller screws and spinner are tightened and in a good condition before every flight (90-110 inch-lbs).
7. Make sure the engine is firmly fixed to the engine mount periodically.
8. Do not operate the engine or fly your plane alone.
9. Do not allow anyone to stand in front of or next to the engine and propeller. Always stand behind the engine and propeller when the engine is running.
10. Wear close-fitting clothing when operating the engine. Loose clothing and material such as gravel, power cords or rope can be drawn into the spinning propeller which may cause severe injury or death.
11. Wear thick leather gloves or use a starting stick to start the engine up. It's not recommended using your own hands or fingers to do so.
12. Operate the engine in a well-ventilated area. Do not operate it indoors.
13. Spectators or bystanders, especially children and pets, should be at least 10 meters away from the running engine.
14. Always turn the engine off before making any adjustment.
15. Use the ignition kill switch to stop the engine.
16. Gasoline is highly flammable. Sparks from electrical contacts such as battery chargers,

fuel pumps are dangerous. Smoking near the fuel supply or engine can lead to serious consequences. Fuel must be stored in an approved container in well-ventilated areas.

17. The engine temperature will be very high when/after running. Do not touch or refuel the engine until it cools down.
18. Do not connect GP engines with RCEXL tachometers because they are incompatible and it could cause damage to the ignition and engine.
19. Regular carbon steel screws are not strong enough for high horsepower engines. Therefore, M6×55 special alloy screws come with our GP178. They are special alloy (SNCM439)<sup>1</sup> which has a better tensile strength to prevent propeller screws from breaking during flights. M6×55 can only applied on GP178 only.
20. Manually insert the propeller screws to a point where the threads of screw (MPT) and the threads of hole (FPT) are properly engaged, before using an electric screwdriver to tighten the screws or it may damage the MPT and FPT which might cause the propeller screws to break during flights.

## CHOOSING A PROPELLER

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1. Propellers of identical dimensions produced by different manufacturers tend to vary in performance. This can even be true when propellers are of the same dimensions and brands. It is important to realize that environmental factors, such as temperature, atmospheric pressure, plane weight, exhaust system, will affect propeller load.
2. In terms of materials, carbon fiber propellers usually produce higher RPM than wood propellers of the same diameters and pitches.
3. Never forget to balance your propeller because it is critical to your engine's health.
4. Always use a drill press to drill your propeller at the back. Imprecise drilling is very likely to result in sheared propeller bolts. If you have difficulties in tightening the propeller bolts, it can be a sign of imprecise drilling in the propeller. Only balanced and precisely drilled propeller can be used on your engine.
5. It is not recommended using carbon fiber back plate and spinner together, as it may result in sheared propeller bolts. Only alloy back plate is recommended.
6. Ignorance of the above-listed instructions can lead to vibration in the unbalanced propeller, and therefore bearing damage and/or crankshaft twist.

The following chart shows recommended propellers for each model.

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<sup>1</sup> SNCM439 is heat-treated alloy steel with tensile strength within a range of 950~1100 MPa. This grade has high hardenability and can be applied to high tensile steel sections.

Engine	Recommended Propeller	Note
GP38		
GP61	<b>Two-Blade</b> 22×12, 23×10, 24×8, 24×10 <b>Three-Blade</b> 21×12, 22×10	GP61 is designed for a maximum power of 8900 RPM. We recommend that you not use propellers that will exceed 7700 RPM during ground running.
GP76	<b>Two-Blade</b> 22×12, 24×9, 24×10, 24×10TH, 25×8, 26×8 <b>Three-Blade</b> 21×12, 22×10, 22×12, 23×10	GP76 is designed for a maximum power of 9000 RPM. We recommend that you not use propellers that will exceed 7700 RPM during ground running.
GP88	<b>Two-Blade</b> 26×10, 26×12, 27×10, 28×10	GP88 is designed for a maximum power of 8500 RPM. We recommend that you not use propellers that will exceed 7300 RPM during ground running.
GP123	<b>Two-Blade</b> 27×12, 28×10, 28×12, 29×10 <b>Three-Blade</b> 25×12, 26×12	GP123 is designed for a maximum power of 8900 RPM. We recommend that you not use propellers that will exceed 7300 RPM during ground running.
GP178	<b>Two-Blade</b> 30×13, 31×12, 32×10	GP178 is designed for a maximum power of 9000 RPM. We recommend that you not use propellers that will exceed 6700 RPM during ground running.

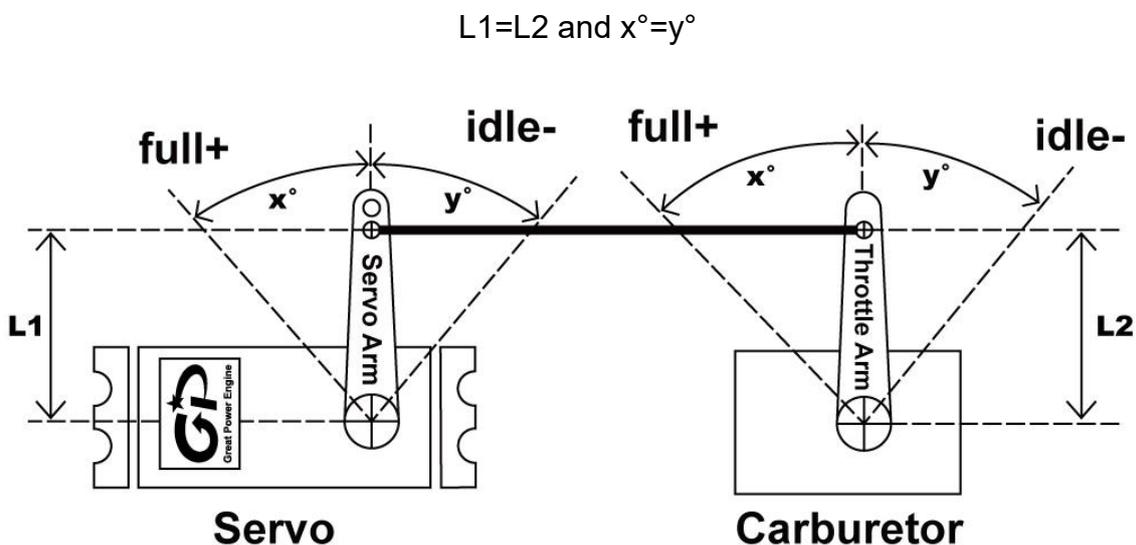
## FUEL AND OIL MIXTURE

Always use 40~50 units of unleaded 89~93 octane fuel mixed with 1 unit of synthetic oil (mixture ratio 40~50:1). We recommend *Red Line Two-Stroke Racing Oil* and *Motul 710*. These oils can be found at most motorcycle stores. Synthetic oils used in cheap garden appliances are not intended for methanol machines and therefore must not be used. Do not use mixed fuel that is more than 90 days old. GP does not take responsibility for any damage resulted from using low-quality fuel.

# ENGINE INSTALLATION

1. **Screw:** You can directly mount the engine on the firewall. We recommend M6 screws for your GP engine. The firewall should be stiff enough to prevent engine vibrations. Use high-grade 1/4 bolts with washers and locknuts in the back of the firewall. Make sure your firewall is structurally sound.
2. **Servo:** We recommend a high-quality servo for the throttle, as it can ensure accurate and reliable throttle operation. We also recommend a high-quality servo linkage. Do not use metallic servo linkages, because this could cause radio interference.
3. **Fuel Tank:** We recommend a 450cc~500cc fuel tank for GP61, 600cc~800cc for GP76, 800cc~1000cc for GP123/GP88, and 1500cc for GP178. The tank must be vented and routed to the outside of the plane, preferably to the bottom of the cowl.
4. **Cooling:** Proper air circulation under the cowl must be ensured because cooling is critical to engine's performance and longevity. To cool the engine, an appropriately-sized air intake is required. The exhaust outlet should be 3 times larger than the intake. Make sure cool air goes through cylinder fins and does not bypass them to take an easy route to the exit. It is better to build baffles because they can create turbulent air movements in the cylinder fins, which results in maximum cooling for an air-cooled engine.
5. **Caution:** It is important to use seals to prevent sawdust, residual abrasives etc. from entering engine interior through the openings when engine is being mounted in the model. Keep the fuselage interior clean and make sure that all parts are tightly placed so that they will not get drawn into the engine.

# END POINT ADJUSTMENT



# NEEDLE SETTING<sup>2</sup>

Needles are pre-adjusted by factory default. By turning the needle clockwise, you **lean** the fuel mixture. By turning the needle counterclockwise, you **richen** the fuel mixture. Needle settings will vary based on different conditions, such as altitude, temperature, fuel carburetor variances, humidity, etc. When needle settings are optimal, the engine will clean out and have a strong sound, high-pitched whine at full throttle. It is always better for an engine to run a little richer than to run lean.

**Step 1:** Turn both high and low needles clockwise gently until they stop. Do not over tighten the needles.

**Step 2:** Turn both high and low needles counter-clockwise to regulated points.

The general starting points of needles are as follows.

Engine	Low Needle	High Needle
GP38		
GP61	1 ½ open	1 ½ open
GP76	1¾ open	1¾ open
GP88	1 ½ open	1 ½ open
GP123	2 open	1 ½ open
GP178	2 open	2 open

**Caution:** The needles get damaged when they are tightened with too much force. Adjustments to carburetor cannot be made once the needles are damaged and therefore must be replaced.

## Symptoms of Running Lean

When a carburetor is running lean, the fuel-to-air ratio is off because the carburetor is distributing too much air. (1) Signs that high needle is too lean include engine stalling on acceleration and beginning to slow down at full throttle, abnormally high temperature on cylinders (overheating) (2) Signs that low needle is too lean include difficulty in starting the engine and rough idling. In general, typical symptoms of a lean mixture are:

- Backfiring as the throttle is closed
- Lurching acceleration
- White or light gray spark plugs
- Requiring excessive amounts of choke to run/start
- White or light gray muffler end pipes

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<sup>2</sup> Understand the Engine Terms "Rich" and "Lean": The needles on the carburetor regulate the amount of air and fuel (air-fuel mixture) that enters the engine. When the air-fuel mixture is "rich", there is too much fuel. When the air-fuel mixture is "lean", there is not enough fuel for a given amount of air.

- High temperature on cylinders

### **Symptoms of Running Rich**

When an engine is running rich, the fuel-to-air ratio is off because the carburetor is delivering too much gasoline. (1) Signs that high needle is too rich include sluggish performance, excessive amount of smoke from exhaust, engine stalling on acceleration. (2) Signs that low needle is too rich include engine easily overflowing at starting procedure and slow throttle response between low and mid-range RPM. In general, typical symptoms of a rich mixture are:

- Poor fuel economy
- Sluggish acceleration
- Choke not needed from cold starts
- Sooty or black spark plugs
- Sooty or black muffler end pipes
- Strong smell of gasoline when the engine is at idle
- Uneven running (will often slow from regular idle RPM and then stop)

## **STARTING PROCEDURE**

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1. Make sure propeller bolts are all well tightened.
2. Make sure the area is clear of any kind of debris, sand, dirt or gravel.
3. Have someone with eye protection firmly hold the plane. At least two people are required to start the engine.
4. Wear heavy-duty leather gloves when starting the engine.
5. Switch the radio system on and make sure all controls work correctly and are in correct direction. Set the throttle cut switch to fully close the throttle and shut the engine off. After setting it up, re-test for the throttle to make sure it will shut the engine off.
6. Switch the ignition on and close the choke. Next, flip the propeller until the engine starts and runs for a few seconds.
7. Release the choke and the throttle setting should be a little higher than idle position. Quickly flip the propeller. It usually takes 5 to 10 flips to start the engine. Beware of the possibility of engine starting on any single flip of the propeller anytime, even if the ignition is off.
8. After the engine starts, slowly push the throttle to low idle and warm up the engine for 30 seconds. Next, slowly open the full throttle and hold it for 5 seconds to make sure the engine can maintain maximum power. Lastly, move throttle back and set the idle at low RPM.

# BREAK-IN

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Always break in the engine on a plane. If you break in the engine on a test stand, even with a proper cooling system, it might still cause the engine to overheat. An engine is considered fully broken-in after 25 liters of fuel. The break-in procedure is as follows.

1. Idle the engine for 2~3 minutes (lower than 2500 RPM).
2. Slowly push the throttle forward at around 4000~4500 RPM and run on one tank of fuel. Next, shut the engine off and let it cool down.
3. Restart the engine at idle for 1 minute. Then slowly push the engine to full throttle. Do not remain at full throttle for more than 5 seconds. Make sure the needle settings are correct and the engine is running smoothly.
4. Shut off the engine again and let it cool down before putting the cowling on and fly the plane. If broken-in properly, the engine will run smoothly from the beginning and progressively improve as flight hours accumulate.

## Caution:

- Make sure you have a proper cooling system on your plane before flying.
- Do not operate the engine at full throttle for over 10 seconds before it has been broken-in.

# TOUBLESHOOTING (Engine Won't Start)

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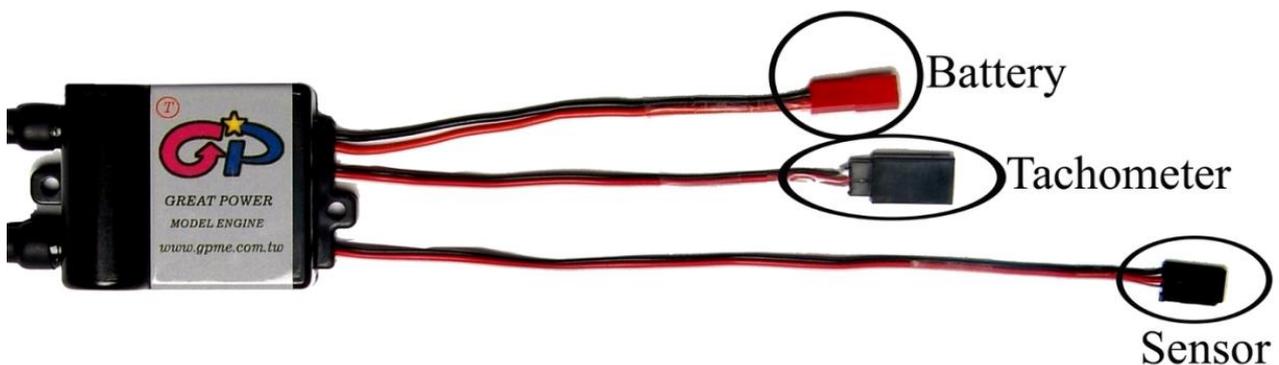
1. Make sure the battery voltage is over 6.6+ when under load.
2. Check all the ignition connection, wiring, and switches.
3. Check the fuel system for clogs, jams, or bad fuel lines.
4. Make sure the propeller is flipped over with authority.
5. The carburetor mount must be tight or the engine may not start because of air leaks.
6. When too much fuel drips from carburetor, the engine may be overflowed. If so, you can
  - (a) Turn off the ignition system and make sure the choke and throttle are completely open.
  - (b) Flip the propeller for about 10 times at full throttle.
  - (c) Close the throttle to idle position and follow the starting procedure again.
  - (d) For single-cylinder engines (GP38, GP61 and GP88), you can unscrew spark plugs to check contacts, and dry or replace them. Further starting must be done with the throttle turned down. However, if the spark plugs are dry, then the fuel drawn into carburetor might not be enough.
7. With standard starting procedures, if the engine starts and then stops immediately, the low needle is probably too lean. Turn the low needle counterclockwise for around 1/8 turn.
8. If the engine does not reach a normal RPM at full throttle, go back to GP mufflers and

original needle settings. If the problem persists, the causes may be

9.
  - (a) Low battery
  - (b) Diameter of the propeller larger than recommended<sup>3</sup>
  - (c) Incorrect fuel and oil mixture<sup>4</sup>
  - (d) Muffler/ pipe system affects the RPM. If you use a pipe, make sure length of the header and the needle settings suit requirements of the pipe and header you use.
  - (e) Incorrect ignition timing and failing spark plugs, which will result in twisted crankshafts and therefore lower RPM.
10. If the engine runs roughly or vibrates strongly:
  - (a) Check if the low needle is too rich
  - (b) Check balance of the propeller and spinner
  - (c) Make sure the engine mount bolts are well tightened.
  - (d) Check if the ignition timing is correct.
  - (e) Check structure of the engine box and firewall on the plane.

## IGNITION WIRE DIAGRAM

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## MAINTENANCE

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As a high-performance two-stroke engine, certain parts of GP178 may wear out more quickly than the other models. Pistons, piston rings, needle bearings, spark plugs and so on may need to be occasionally replaced out of warranty to maintain peak performance. Check screws of the engine, firewall, and propeller to make sure they are in good condition and well tightened to the required torque value on a regular basis. The following chart lists the sizes of screws and their torque values.

<sup>3</sup> Please refer to *Choosing a Propeller*

<sup>4</sup> Please refer to *Fuel and Oil Mixture*

Parts	Engine	Screws	Torque Value
Spark Plug	All Engines		100 in-lbs
Hub Screw	All Engines	Customized	250~280 in-lbs
Crankcase Bolts	GP38		
	GP61	M5x20	90~100 in-lbs
	GP76	M5x20	
	GP88	M5x18	
	GP123	M5x30	
	GP178	M5x25	
Cylinder Base Bolts	GP38		
	GP61	M5x16	90 in-lbs
	GP76	M5x16	
	GP123	M5x16	
	GP88	M5x18	90~100 in-lbs
	GP178	M5x20	
Carburetor Mount Bolts	GP38		
	GP61	M5x50	70 in-lbs <sup>5</sup>
	GP76	M5x75	
	GP88	M5x45	
	GP123	M5x45	
	GP178	M5x108	
Propeller Bolts	GP38		
	GP61	M5x45	75 in-lbs for Wood Prop 90 in-lbs for Carbon Prop
	GP76	M5x45	
	GP88	M5x45	
	GP123	M5x50	90 in-lbs for Wood Prop 110 in-lbs for Carbon Prop
	GP178	M6x55 <sup>6</sup>	

- The engine must be regularly check for fuel seepage at this could indicate a lean fuel/air ratio, which might cause erratic running or damage to engine.
- We recommend spark plug replacement every 20 hours of running, reed valve check after 50 hours, and a complete checkup of engine by authorized service centers after 300 hours.

<sup>5</sup> The needles get damaged when they are tightened with too much force. Adjustments to carburetor cannot be made once the needles are damaged and therefore must be replaced.

<sup>6</sup> Regular carbon steel screws are not strong enough for high horsepower engines. Therefore, M6x55 special alloy screws come with our GP178. They are special alloy (SNM439) which has a better tensile strength to prevent propeller screws from breaking during flights. M6x55 can only applied on GP178 only.

# LIMITED WARRANTY

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Great Power Engine's products are warranted against defects in materials and workmanship for a period of TWO (2) YEARS from the date of original purchase from an authorized dealer of Great Power Engine when used in accordance with this instruction manual. Under this warranty, you will be able to file a warranty claim for your GP products. GP will have the absolute discretion to approve or reject warranty claims.

1. The warranty is valid only when the warranty card indicating the date of purchase and the dealer's/ seller's name is presented to GP.
2. The warranty does not cover damage caused by (i) misuse and mishandling (ii) unskilled repair (iv) unauthorized modification (v) crash and crush (vi) use of aftermarket parts (vii) use of low-quality/improper fuel and/or additives.
3. The warranty covers parts of GP engines and ignitions (CDI).
4. The warranty does NOT cover mufflers, for they are only articles given free.
5. The warranty includes repair and replacement of defective parts and engines, shipping charges, and labor charges.
6. If you are a GP dealer, make sure you fill in all the necessary information on the warranty card and give it to your customer. If you are a customer, make sure you ask your dealer for a GP-issued warranty card with necessary information on it.
7. When filing a warranty claim, please present (i) warranty card (ii) maintenance form (iii) photos and/or videos indicating issues.

## US SERVICE CENTERS

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*Aviator Plus RC, Mile High RC, and Planebender Products* offers excellent after-sales service. After-sales service will only be provided by the original dealer. Please contact your dealer if you need any technical support, engine maintenance, or warranty service. Other dealers will not be responsible for providing the stated services.

### Aviator Plus RC

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