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VPHL

GASOLINE POWERED ENGINES

MODELS:

VPHL210
VPHL420
VPHL460

OWNERS AND OPERATIONAL MANUAL

FOR USE IN NON-REGULATED TERRITORIES ASIA MIDDLE EAST AND AFRICA

TABLE OF CONTENTS

1. INTRODUCTION

Thank you for choosing our General-Purpose Gasoline Engine.

- Single-Cylinder, 4-Stroke, Forced Air-Cooled
- OHV,
- TCI Ignition System
- Splash Lubricated

Proper use and regular maintenance of this engine will ensure reliable performance and extend its service life. Please read this manual carefully before operating the engine and familiarize yourself with all recommended operating and maintenance procedures.

Precautions:
Failure to follow the safety notes and precautions listed below may result in personal injury or severe engine damage. Please pay close attention to the following:

Notes:

- Coupling the engine to any equipment must strictly comply with the rated power output indicated on the engine nameplate. Operating the engine under overload conditions, at excessive RPM, or for prolonged periods at low load and low RPM is strictly prohibited.
- Only use the recommended fuel and lubricating oil. Ensure all fuel and oil are properly stored, filtered, and clean before use. Keep oil filters clean and replace engine oil at the specified intervals. Always inspect fuel lines and connections for looseness or leaks. Fuel leakage can create a potentially dangerous situation.
- Periodically inspect all bolts and nuts for looseness. Loose fasteners can lead to serious engine damage or operational failure.
- Clean the air cleaner element regularly and replace it when necessary.
- Remove dirt and debris from the cooling fins, fan, and fan cover promptly to maintain proper airflow and ensure normal engine cooling performance.
- Users should be familiar with the engine structure, correct operating procedures, and required maintenance. Troubles should be addressed immediately when detected. Do not operate the engine if abnormal conditions or faults are present.
- The exhaust muffler becomes extremely hot during operation and remains hot after shutdown.
  Avoid touching it to prevent burns and keep children and unauthorized persons away from the running engine.

1.1 Safety Precautions

Exhaust Precautions:

- During engine operation, the exhaust gases contain carbon monoxide— a colourless, odourless, and extremely dangerous gas that can cause unconsciousness or death. To prevent accidents, never operate the engine indoors or in poorly ventilated areas such as tunnels, caves, or enclosed rooms.
  If operation in such an environment is unavoidable, the exhaust gases must be directed outdoors, and the exhaust outlet must be at least 1 meter away from any doors or windows. Always exercise extreme caution when operating the engine near people or animals.

Fire Prevention:

- Keep the engine away from all flammable and hazardous materials, including trash, rags, lubricants, and explosives. Do not operate the engine while smoking or near open flames.
  Avoid using the engine around dry brush, twigs, cloth rags, or other easily combustible materials. Maintain a minimum clearance of 3 feet (1 meter) between the engine and any building, structure, or obstruction.

Refuelling Precautions:

- Always stop the engine before refuelling. Do not overfill the fuel tank. If fuel is spilled, wipe it up immediately and allow the area to fully dry before restarting the engine.

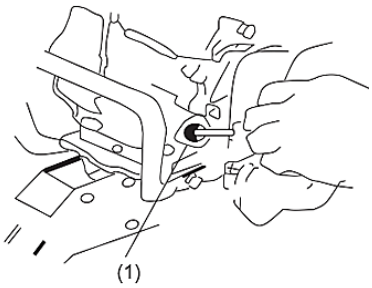
Operating Environment:

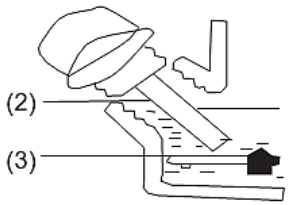
- Operate the engine on a stable, level surface free from small rocks, loose gravel, or debris. Tilting the engine may cause fuel leakage or spillage.
  Do not move the engine while it is running. When transporting the engine over long distances or rough terrain, drain the fuel tank to prevent fuel leakage.

2. PREPARATION BEFORE OPERATION

2.1 Check Lube Oil Level

When the engine is stopped, remove the oil dipstick and check that the lubricating oil level is within the specified range. If the oil level is below the minimum mark, add engine oil until it reaches the correct level—do not exceed the maximum mark. For optimal protection and performance, SAE 15W-40 lubricating oil is recommended.

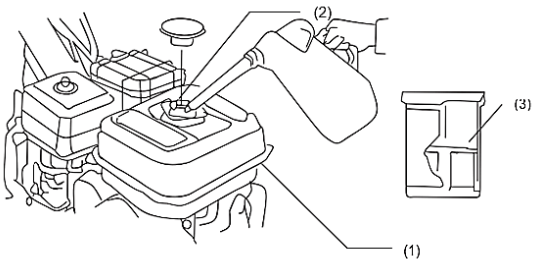




1. Oil dipstick hole
2. Max.oil level
3. Min.oil level

2.2 Check Fuel Level

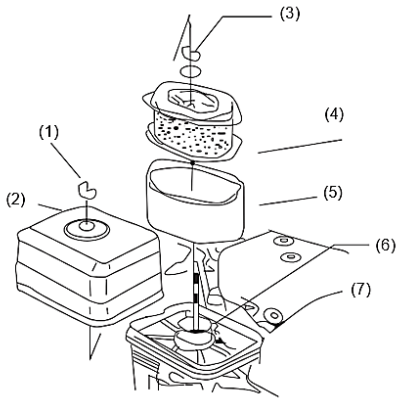
Open the fuel tank cap and check the fuel level.
If the fuel is low, add gasoline through the filling port until the level reaches the red stop plate inside the strainer. Use gasoline grade #90 or higher.
Do not mix gasoline with lubricating oil.
Ensure that the fuel is clean and free from dust, water, or any impurities before filling.



1. Fuel tank.
2. Fill-in hole.
3. Red scale line for upper fuel level.

2.3 Check Air Cleaner

The air cleaner is a dry-type assembly consisting of two filter elements: a paper element and a foam element.
To inspect or clean the filters, remove the air cleaner cover. If dust or dirt is present, wash the elements in gasoline or kerosene, then allow them to dry completely.
Repeat the cleaning process several times, if necessary, before reinstalling the elements onto the engine.

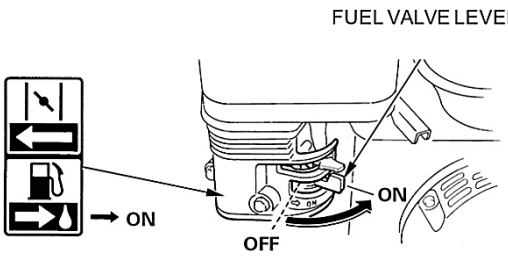


1. Butterfly nut.
2. Air cleaner cover
3. Butterfly nut.
4. Paper filter element.
5. Foam filter element.
6. Gasket.
7. Cleaner base plate.

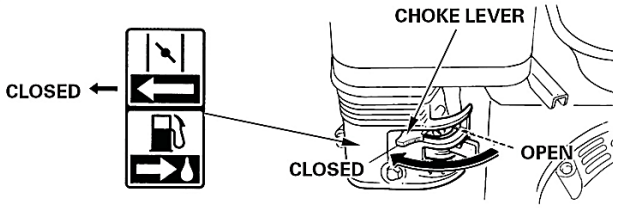
3. STARTING AND STOPING OF ENGINE

3.1 Start the Engine

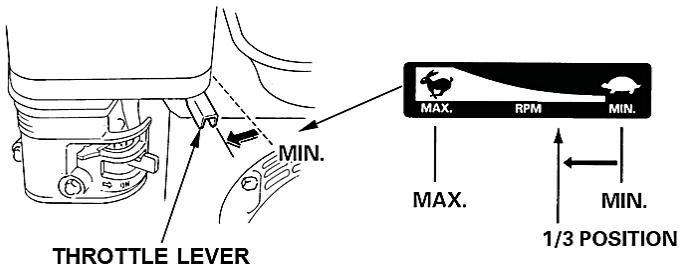
Move the fuel valve lever to the **ON** position.



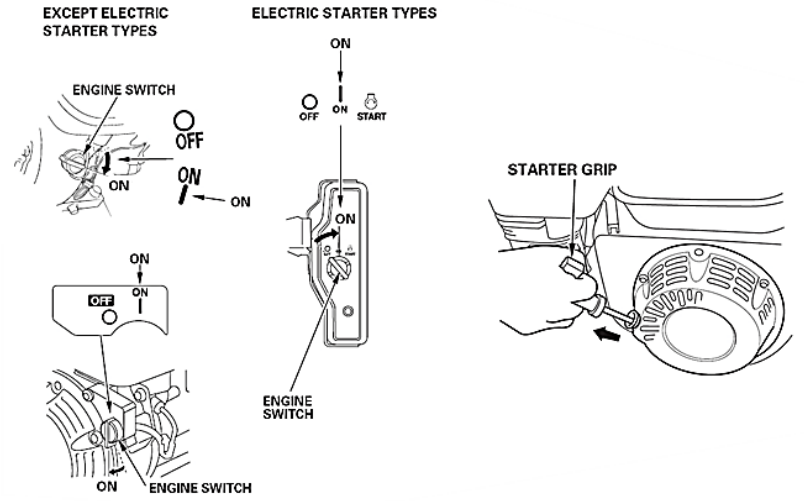
To start a cold engine, move the choke lever to the **CLOSED** position.



To restart a warm engine, keep the choke lever in the **OPEN** position.
Move the throttle lever slightly away from the **MIN** position, approximately one-third of the way toward the **MAX** position.



Turn the engine switch to the **ON** position.



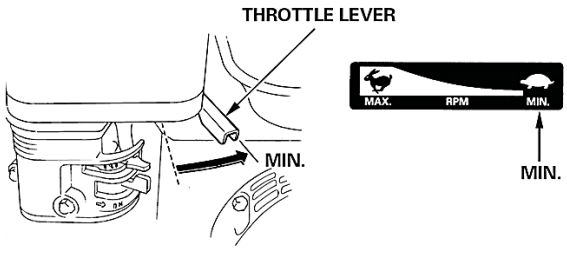
Turn the engine switch to the ON position.

Recoil Starter:
Pull the starter grip lightly until you feel resistance, then pull it briskly.
Return the starter grip gently to its original position.
Do not allow the starter grip to snap back against the engine.
Return it gently to prevent damage to the starter mechanism.

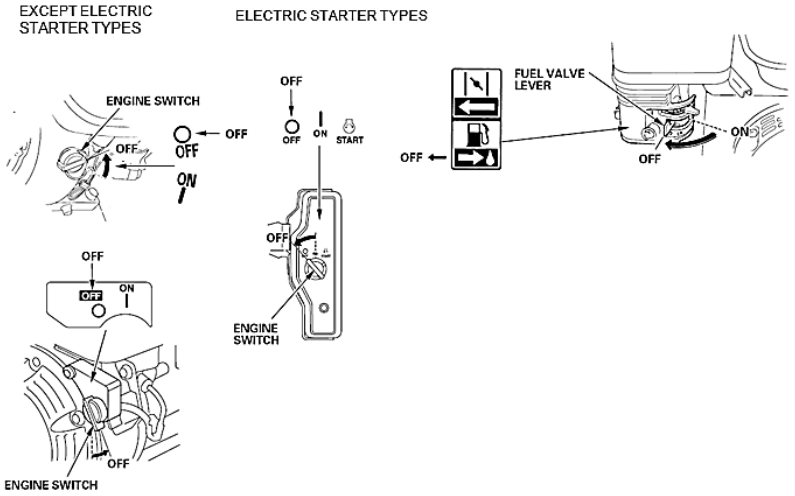
Electric Starter (for applicable models):
Turn the key to the **START** position and hold it until the engine starts.
If the engine does not start within **5 seconds**, release the key and wait at least **10 seconds** before attempting to operate the starter again.

3.2 Stop the Engine

To stop the engine in an emergency, simply turn the engine switch to the **OFF** position.
Under normal conditions, follow the stopping procedure recommended by the equipment manufacturer.
Move the throttle lever to the **MIN** position.



Turn the engine switch to the **OFF** position.
Turn the fuel valve lever to the **OFF** position.



4. MAINTENANCE

Routine Maintenance

- Check the air cleaner filter elements and remove any dirt or dust to keep them clean.
- Inspect all bolts and nuts to ensure they are properly tightened.
- Check the lubricating oil level according to Section 2.1 of Part 2.

Air Cleaner Maintenance

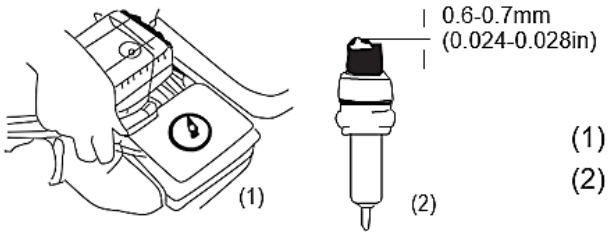
- Clean the air cleaner after every 25 hours of operation, following the procedure described in Section 2.3 of Part 2.

Spark Plug and Cooling Fins

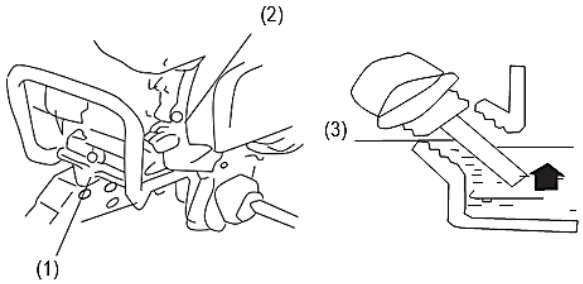
- Inspect the spark plug after every 50 hours of operation.
- Remove any carbon deposits and adjust the gap to 0.6–0.7 mm (see Figure 4-1).
- Check the engine's cooling fins and remove any accumulated dirt to ensure proper heat dissipation.

Lubricating Oil Replacement

- Unscrew the oil drain plug and tilt the engine slightly to drain the old oil.
- Fill the crankcase with kerosene to clean it, then drain the kerosene completely.
- Tighten the drain plug and refill with fresh lubricating oil to the specified level.



1. Remove the spark plug.
2. Adjust spark plug gap.



1. Oil drain plug.
2. Fill oil hole.
3. Specific oil level.

Fuel Tank and Strainer Maintenance

Clean the fuel tank and filter strainer after every 100 hours of operation:

1. Open the fuel tank cap, remove the filter strainer, and clean it with a brush.
2. Remove the fuel tank, clean the internal surfaces, and remove any dirt or water.

3. Reinstall the fuel tank and filter strainer, then refill with fresh fuel until the level reaches the red scale line (refer to Section 2.0 of Part 2).

Oil Tube Inspection

Check the condition of the oil tube every 2 years.

- Replace the oil tube if there is any sign of aging, hardening, or cracking.
- Ensure all new oil tube joints are properly tightened to prevent leakage.

Long-Term Engine Storage

- If the engine will be stored for an extended period, follow these steps:

Fuel System:

- Remove the fuel tank and drain all fuel. Clean any dirt or water inside the tank.
- Open the fuel cock, unscrew the carburettor drain plug, and completely drain all fuel from the carburettor. Then tighten the drain plug.

Lubricating Oil:

- Unscrew the drain plug at the bottom of the crankcase and drain all oil. Then tighten the drain plug.

Cleaning:

- Clean the outer surface of the engine with a clean cloth to remove dirt and dust.
- Store the engine in a dry place.

Model	Cylinder Head Bolts	Crankcase Cover Bolts	Crankcase Cover	Fly Wheel Bolts
HL90	24	24	12	50
HL210	24	24	12	80
HL225	24	24	12	80
HL420	34	24	14	113
HL460	34	24	14	113

Item	Specification
Spark plug gap	0.6~0.7mm (0.024~0.028in)
Valve clearance(cold)	IN:0.1 0.15mm EX:0.15 0.2mm
Other specification	No other adjustments needed

5. TROUBLESHOOTING

5.1 Low Power Output

Symptom	Cause Analysis		Troubleshooting
When turning throttle greater, rising of speed responds slowly or speed is decreased or engine stops running.	Ignition system	Incorrect ignition time	Readjust ignition advance angle
	Fuel supply system	Air in fuel line or fuel line clogged	Exploring air or dredge fuel line
		Main jet is not adjusted properly	Readjust
		Metering jet and main jet clogged in carburettor	Clean and blow to get through
		Fuel cock is clogged up	Clean and replace damaged part
		Too much carbon fouling in combusting chamber	Clear away
		Too much carbon fouling in muffler and exhaust pipe	Clear away
		Air cleaner is clogged up	Clean air cleaner element
		Intake pipe is leaking	Repair or replace
	Poor compression	Piston or cylinder or piston ring is worn	Replace the worn part
		Air leakage from the surface by which cylinder block contacting with cylinder head	Replace cylinder gasket
		Too big or too small valve clearance	Readjust
		Valve tightness is poor	Repair

5.2 Engine cannot Run Smoothly

Symptom	Cause Analysis	Troubleshooting
Engine is pinking	Piston, cylinder or piston ring is worn excessively	Replace the worn parts
	Piston pin and piston pin hole are worn excessively	Replace piston or piston pin
	Tie rod small head is worn excessively	Replace tie rod
	Roller bearing for crankshaft is worn	Replace roller bearing
Abnormal combustion	Engine is too hot	Troubleshoot
	Too much carbon fouling in combustion chamber	Clear away
	Improper gasoline class or low gasoline quality	Replace with qualified gasoline
Engine cannot start because of spark lacking	There is water in floater room	Clean
	Improper spark plug electrode clearance	Adjust
	Incorrect ignition time	Readjust
	Something failed with induced coil, and so on	Check and replace damaged parts.

5.3 Stop Suddenly when Running

Symptom	Cause Analysis		Troubleshooting
Stop suddenly when running	Fuel supply system	Fuel is used up	Refill fuel
		Carburettor is clogged	Check fuel line and dredge
		Float is leaking	Repair
		Needle valve sticks	Dismantle float bowl and troubleshoot
	Ignition system	Spark plug is struck through, or short circuited by carbon fouling	Replace spark plug
		Side electrode of spark plug is dropped out	Replace spark plug
		High-voltage wire is dropped out	Weld on
		Ignition coil is struck through to be short-circuited	Replace ignition coil
		Parking wire is located on engine body	Find out meeting and insulate
	Others	Cylinder is pulled damage and valve is dropped out	Repair or replace damaged parts

5.4 Engine is Excessively Hot

Symptom	Cause Analysis	Troubleshooting
Engine is excessively hot	Improper ignition time	Adjust ignition advance angle properly
	Insufficient fuel supply	Refill sufficient fuel
	Exhaust pipe is clogged	Dredge exhaust pipe
	Flow guard is leaking	Repair leakages
	Dirt or something else jams among air cooling fins	Clear away dirt or something alike
	Cooling fan is loosened and malfunction	Reinstall properly
	Tie rod deformation makes piston and cylinder bushing side wear	Replace tie rod
	Cylinder or piston or piston ring is worn resulting in air flow between cylinder and crankcase	Replace the worn parts
	Improper adjustment of engine speed	Readjust engine speed
	Excessive rotational speed occurs	Readjust speed regulator
	Crankshaft main bearing is burnt out	Replace main bearing

The engine should be operated within a specified temperature range:

- The temperature at the flow guard outlet is generally permitted to be between 80–110°C.
- The temperature of the crankcase under the magneto motor should be around 60°C.

If the temperature exceeds the upper limit, it indicates that the engine is overheating, and operation should be stopped to prevent damage.

5.5 Abnormal Noise Occurs when Engine is Running

Symptom	Cause Analysis	Troubleshooting
Noise of beating	Piston or piston ring or cylinder is worn	Replace the worn parts
	Tie rod or piston pin and piston pin hole is worn	Replace the worn parts
	Crankshaft main bearing is worn	Replace
	Piston ring is broken	Replace
Metal-beating noise in abnormal combustion	Too much carbon fouling in combustion chamber	Clear away carbon fouling
	Too small electrodes clearance of spark plug properly	Adjust electrodes clearance
	Engine is flooded with fuel	Check relating parts such as carburettor
	Improper fuel class	Replace fuel
	Engine is excessively hot	Troubleshoot
Others	Improper valve clearance	Readjust valve clearance properly
	Fly wheel is not connected to crankshaft tightly	Connect tightly

6. DISMANTLEMENT AND ASSEMBLY

6.1 Dismantling Precautions

Proper Dismantling

- Only dismantle parts that are necessary. Avoid removing sealing or moving components such as pistons, piston rings, or other critical internal parts.

Temperature Considerations

- Never dismantle parts (except the spark plug, carburettor, or magneto motor) while the engine is hot, as this may cause damage or deformation.

Installation Considerations

- Mark parts located in special positions, such as piston rings, both sides of the cylinder gasket, and connecting wires, to ensure correct reassembly.
- Keep parts from the same component together for easy and accurate installation.

Cleaning and Storage

- Clean all removed parts and store them in groups according to their installation relationship.

Bolt Removal

- When dismantling bolts, first loosen them in a diagonal pattern, then fully remove them.

Tight or Press-Fit Parts

- Use appropriate extractors to remove tight or press-fit parts, such as bearings.

Opposite-Thread Bolts

- For bolts with opposite threads, loosen them clockwise first, then use a screw extractor if necessary.

6.2 Dismantling Procedure

- Drain Fuel: Completely drain the fuel from the fuel tank.
- Spark Plug: Remove the spark plug and check the electrode gap.
- Lubricating Oil: Drain the lube oil from the crankcase.
- Flow Guard: Remove the engine flow guard.
- Carburettor: Loosen the lock screw of the carburettor clip and remove the carburettor along with its connecting parts.
- Muffler: Remove the muffler lock screws, then remove the muffler and its gasket.
- Cylinder Head: Loosen bolts in a diagonal pattern, then remove them completely. Remove the cylinder head and cylinder gasket.
- Starter: Remove the starter assembly.
- Flywheel: Remove the flywheel.
- Magneto Motor: Remove the magneto motor.
- Crankcase Cover: Remove the crankcase cover bolts, then dismantle the crankcase.
- Camshaft and Valve Tappet: Remove the camshaft and valve tappet.
- Piston and Connecting Rod: Remove the piston and connecting rod.
- Crankshaft: Remove the crankshaft.
- Valves: Remove both the intake and exhaust valves along with their associated parts.

6.3 Assembling Precautions

Cleaning

- Before installation, thoroughly clean all parts to remove dirt, dust, and debris.

Inspection

- Ensure all parts are in good condition. Repair or replace any damaged or worn components before assembly.

Lubrication

- Apply lubricating oil to critical assembly surfaces, such as the interface between the cylinder bushing and piston.

Bolt Installation

- For bolts that require specific twisting force, such as tie rod bolts and cylinder cover bolts, use a torque wrench to tighten them to the specified torque.

6.4 Assembling Procedure

- **Cleaning:** Clean all parts thoroughly before assembly.
- **Crankshaft:** Install the crankshaft.
- **Valves:** Install both intake and exhaust valves.
- **Piston and Connecting Rod:** Assemble the piston and connecting rod in the correct order. Apply a small amount of lubricating oil into the cylinder and tighten the connecting rod bolts to the specified torque.
- **Valve Tappets and Camshaft:** Assemble the valve tappets and camshaft. Align the timing marks correctly and install the timing gear properly.
- **Cylinder and Cylinder Head:** Install the cylinder gasket and cylinder head and tighten the cylinder head bolts to the specified torque.
- **Flywheel:** Install the flywheel.
- **Starter:** Install the starter assembly.
- **Carburettor and Air Cleaner:** Install the carburettor and air cleaner assembly.
- **Muffler:** Install the muffler.
- **Engine Flow Guard:** Install the engine flow guard.
- **Fuel Tank:** Install the fuel tank and connect the fuel hose properly.
- **Fluids:** Fill the crankcase with lubricating oil and the fuel tank with the recommended gasoline.
- **Spark Plug:** Install the spark plug.
- **Inspection:** Check all connecting joints for reliability and ensure smooth operation. Inspect the speed-adjusting components for proper condition.
- **Engine Start:** Start the engine and observe its operation to confirm proper performance.

Model	VPHL210	VPHL420	VPHL460
Engine Type	Single-cylinder, Four-stroke, Air-cooled, OHV Gasoline Engine		
Bore x Stroke (mm)	70x54	90x66	92x69
Displacement capacity (cc)	208	420	460
Max. Output (Hp)/rpm	7.0/3600	14.0/3600	16.0/3600
Fuel consumption (g/hp.h)	≤374	≤370	≤370
Ignition System	Transistorized Magneto Ignition		
Spark plug	F6TC	F7TC	F7TC
Fuel oil tank capacity (L)	3.6	6.5	6.5
Lubrication oil	SAE 15W/4 0		
Lubrication oil volume (L)	0.6	1.1	1.1
Starting system	Recoil or Electric Starter		
Stop system	Ignition primary circuit ground		
Noise level at 7m (dB)	80	90	90
Dimensions (mm)	310x260x305	376x312x335	450x405x443

Note: The data mentioned above is only for reference!

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