Introduction

Thank you for purchasing MINI Vortex engines. This manual contains information to help you to get the best results from your new engine. Furthermore, it will explain you how to operate your Vortex engine safely and in a proper manner. All the information in this manual is based on the latest experience and product information available at the time of writing. Vortex reserves the right to make any kind of changes to this manual at any time without notice and/or incurring in any obligation.

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TABLE OF CONTENT

GENERAL INFORMATION

SYMBOLS

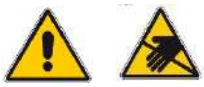
Pay attention to the symbols of this manual. They alert you of dangerous situations for you or for your engine.

Personal Injury

Mechanical Danger

Caution

In order to perform a job, special tools are requested.



SAFETY INFORMATION

-Do not start the engine indoors garages, trailers etc. Start the engine in a well---ventilated area only. Exhaust emission are hazardous to your health.
-Always wear gloves and proper clothing when working on your engine.
-Use caution when handling fuel, as fuel is very flammable and explosive. When working with fuel, do not smoke or use it near fire or flames. Avoid any skin contact and inhaling fuel vapors.
-Never touch moving parts when the engine is running.
-During operation, both engine and muffler, become very hot. Do not touch them and do not place anything on them after operation.
-Do not touch the spark plug or cable. It may provoke electrical shocks.
-Understand the operation of all controls and learn how to stop the engine quickly in case of emergency.
-Do not use the engine without clutch cover and chain protection.

TECHNICAL SPECIFICATIONS

Engine		Max	Min
Displacement		60 cc	n.a.
Bore		42.10 mm	
Stroke	43.00 mm	+0.10 mm	-0.10 mm
Admission system	Piston Port	n.a.	n.a.
Engine cooling	Air cooled		

Intake System		
Inlet	Piston port	
Carburetor	Dell'orto	PHBG 18 BS
Air Box type	VORTEX MINI 1	

Ignition System	Type	Space
Selettra	Analogic	
Recommended time setting		3mm
Sparkplug	NGK B10 EG (recommended)	

General	Type
Mix	3%
Engine Weight	17 kg

-All sizes and measurements in this manual are expressed in metrics.
-Always use original Vortex parts and proper tools when working on your engine. Proper fuel mix is necessary for optimum engine life and performance.

SPECIAL TECHNICAL SPECIFICATIONS FOR HOMOLOGATED ENGINES

Every engine is specified according to the homologation of its country. For specific rules and/or sizes refer to your country homologation file

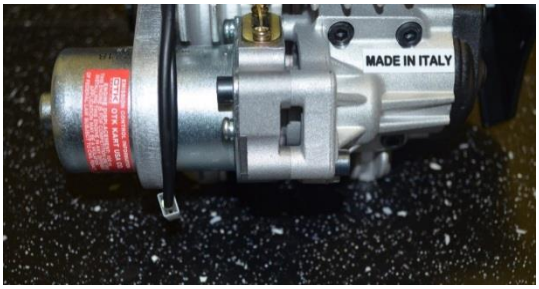
PACKAGING

Your engine will be packed in a sealed box with the Vortex logo printed on and a sticker with model and serial number attached. In a complementary box all the accessories as carburetor, muffler and more will be provided.

The boxes need to have the original vortex logo.

The engine box an official OTK KART USA sticker.

And on the engine starter motor there needs to be an official OTK KART USA sticker too.



ENGINE ASSAMBLY

In order to assemble the engine, you will need the following tools:

Type	Size
Compressed air	
Allen T-wrench	3 mm
Allen T-wrench	4 mm
Allen T-wrench	5 mm
Allen T-wrench	6 mm
Allen T-wrench	8 mm
Fixed wrench	5 mm
Fixed wrench	7 mm
Fixed wrench	8 mm
Fixed wrench	10 mm
Fixed wrench	14 mm
Fixed wrench	17 mm
Fixed wrench	22 mm
Crosshead screwdriver	
Flathead screwdriver	
Spark plug wrench	
Plier	
Torque wrench	
Heater	
Metal brush	

Compressed air

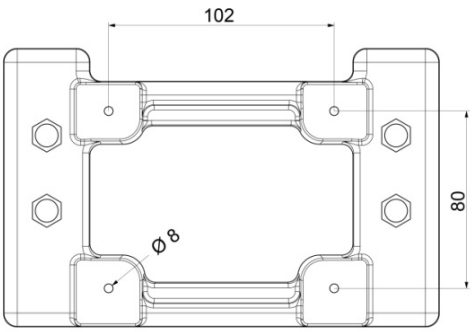
Unpack the engine and remove any packaging material on it. Clean the engine with compressed air and after take of the protecting PVC cups on the inlet, exhaust and spark plug.

ENGINE BRACKET

6mm Allen T-Wrench

Lay the engine on its side and attach the engine mount to the engine base with four 8mm Allen screws. Engine mount and screws come with the engine.

In case the engine mounting points are not drilled yet, drill according to the technical drawing on the right

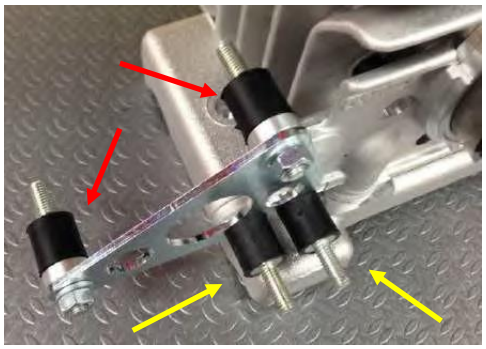


COIL

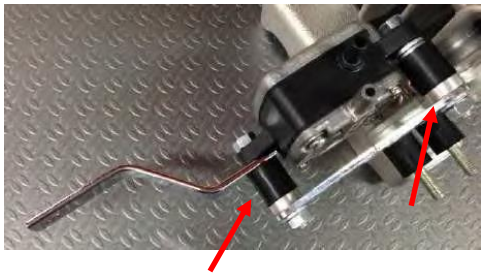
10mm fixed wrench

Assemble coil support and coil as per instructions. All needed parts come with the engine.

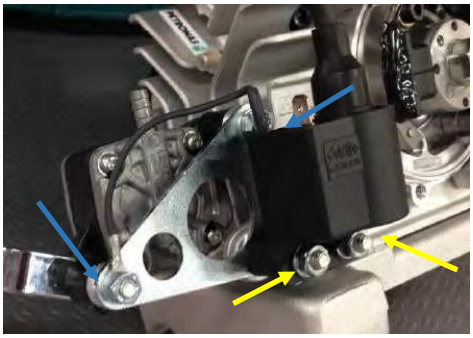
Attach the specific metal-chromed bracket provided to the engine by using 2 of the 4 silent blocks provided (yellow arrows) to the support in the engine. Insert the remained 2 silent blocks (red arrows) with specific spacers and tighten with washer and 6 mm nut. Sometimes thread on the silent blocks could be short, use a thread locker then.



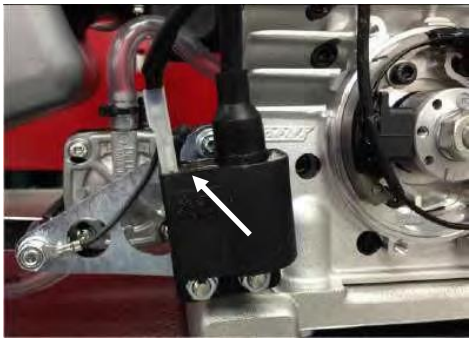
Insert air box bracket into silent blocks (red arrows). Then insert fuel pump into silent blocks (red arrows). Tighten with washer and 6 mm nut. Sometimes thread on the silent block could be short. Use a thread locker then.



Insert the coil into the 2 free silent blocks (yellow arrows). Tighten with washer and 6 mm nut. Then attach the black cable (earth) coming out from the coil to silent block 3 and tighten with washer and 6 mm nut (blue arrows).
Assemble the two silent blocks on the coils support plate in the engine by Sometimes thread on the silent block could be short. Use a thread locker then.



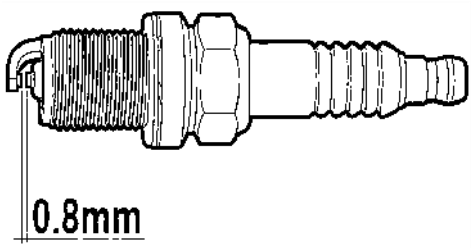
Insert “stop” cable end coming from the ignition into the coil plug.

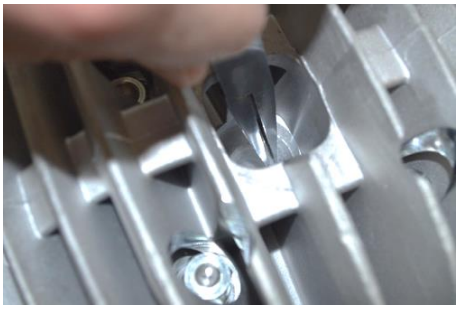


When assembling the coil make sure all the parts are connecting and well tightened. Wrong assembling will result in coil failure and the engine not starting

SPARK PLUG

Unbox the spark plug, the ignition distance must be 0.8 mm like in the drawing below





Spark Plug Wrench
Plier

Remove the PVC cap with the plier from the cylinder head.

Manually tighten the spark plug into the cylinder head.

Lock and unlock with the spark plug wrench 2/3 times to allow the gasket to seat properly. Now you can tighten the spark plug properly.

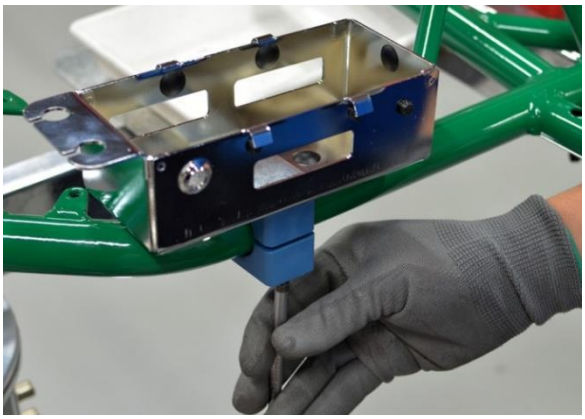
Insert the cable coil in the spark plug cap and tighten it.

For safety, we recommend you to secure the cable coil to the spark plug cap with a plastic strap. Place the spark plug cap on the spark plug and press the cap fully.

BATTERY AND ELECTRONICS HARNESS

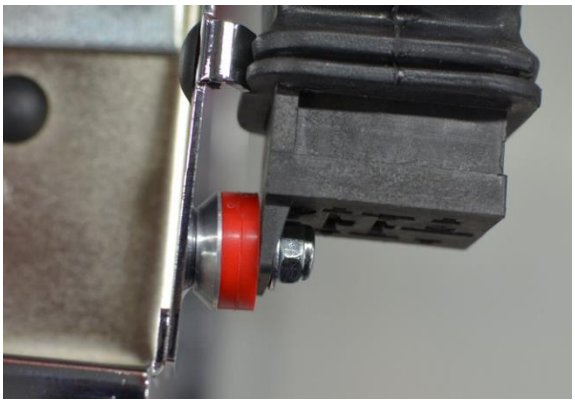
5 mm Allen T-Wrench

Mount the battery holder on the chassis at the side of the seat using the plastic (upper) and iron (lower) jumpers supplied.
A mounting spacer between the jumpers and battery holder may be necessary to overcome the brake hose.

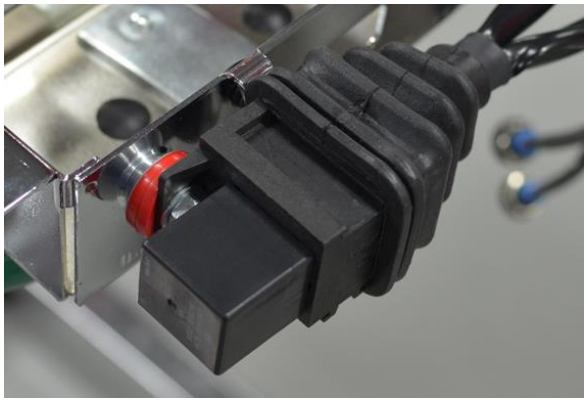


4 mm Allen T-Wrench
10 mm Fixed Wrench

Remove the relay from its housing in the wiring. Fix the housing of the relay to the battery holder using the 6x25 mm screw, the double cone washer, the two rubber spacers, the washer and the 6 mm nut.

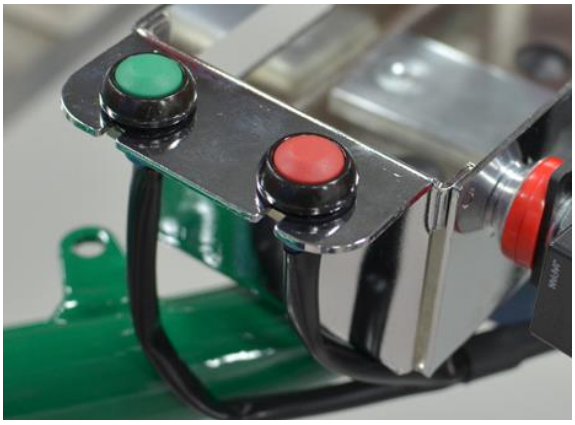


Manually place the relay into the wiring. No tools are needed to do this.



14 mm Fixed Wrench

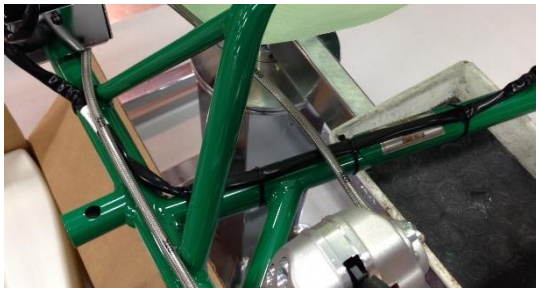
Place the start button (green) and the stop button (red) in the two slots in the front of the battery holder. Secure them by tightening the nuts already placed on the wiring cable.



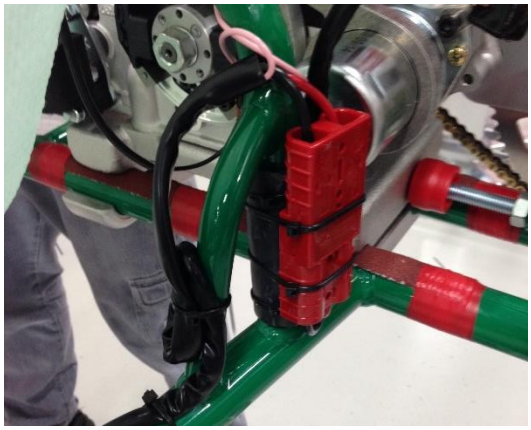
Place the battery inside the battery holder itself. Insert the wiring cables in the battery plugs. The red cable into the red plug and the black wire into the black plug. Secure the battery to its holder using the two rubber O- rings supplied.

Secure the relay with the specific spring provided. Make sure that the spring is in the correct position and press. If it is necessary, bend slightly the spring end with a caliper so as to ensure proper fastening.

Pass the main cable to the side of the seat and secure it to the frame using the plastic straps. Make sure there are no loose cables, they could touch the asphalt and become damaged beyond repair.



Insert the plug that you find at the end of the cable from the battery with the other plug of the cable already placed on the engine.



EXHAUST MANIFOLD

Before fixing the exhaust manifold make sure the exhaust gasket and exhaust port cover are removed. Refit the gasket and bold the exhaust manifold with the nuts and brass spacer to the cylinder. Make sure when assembling the manifold it is locked secure and safely in place.

At a later stage the muffler can be installed to the manifold with the two springs provided

CARBURETOR

Flat Screwdriver

Remove the plastic cap from inlet manifold and remove the carburetor from its box.

Fit the clamp provided together with the carburetor over the inlet rubber manifold.
Insert the carburetor into the inlet rubber

Ensure the carburetor is correctly seated, then tighten the carburetor to the inlet manifold by using the specific clamp.

Screw the air box mount to the carburetor manually. Do not use any tool.

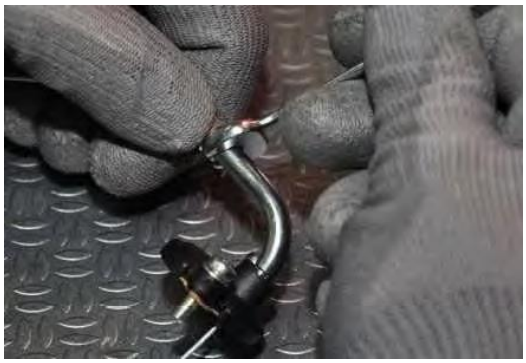
Cross Screwdriver

Remove the top of the carburetor by unscrewing the two screws.

Insert the throttle cable into the elbow on top of the carburetor with the lead nut in.

8 mm Fixed Wrench

Tighten the carburetor throttle cable register elbow.



Pass the throttle cable through the spring and into the cut in the side of the plastic slide cover.

Take the slide out of the carburetor.

Insert the lead at the end of the throttle cable into the hole in the center of the slide.

Hook the lead nut in the slide by moving it aside of the center.

Place the slide, plastic slide cover and spring into the carburetor.

Cross Screwdriver

Fix the top of the carburetor to the carburetor by using the 2 screws unscrewed before

Flat Pliers

By using flat pliers, very carefully, turn the two carburetor overflow elbows on the carburetor to point upwards.

Insert the plastic tube provided on to each one of the carburetor overflow elbows. Cut half of the tube in the middle of the tube length to make a breath.

Flat Screwdriver

Remove the plastic cap from the depression plug in the crankcase.

Insert the fuel line in the depression outlet on top of the fuel pump and the other end into to the depression inlet in the crankcase. Secure it by using a plastic tie.

Insert the fuel line in the outlet on the bottom of the fuel pump. Secure it by using a plastic tie.

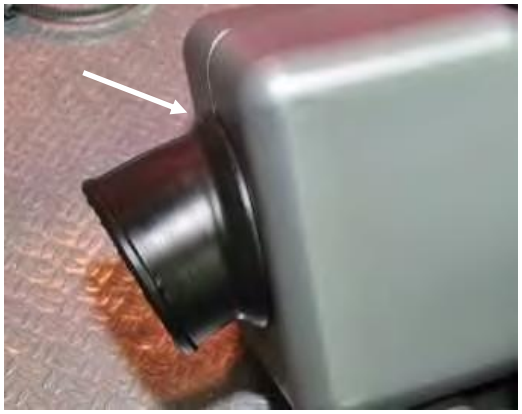
Insert the the fuel line from the outlet on the bottom of the fuel pump to the inlet on top carburetor. Secure it by using a plastic tie.

AIR BOX

Insert the air tube into the intake silencer and then place the plastic stone guard on top of the air tube.

Insert the into the intake silencer. There is a slot in the rubber manifold that should be properly inserted in the intake silencer.

Check the rubber manifold is properly fixed in intake silencer. Wrong assembly will can cause loss of the foam filter and/or intake silencer.



4 mm Allen wrench
10 mm Fixed wrench

Use the specific “S” bended bracket assembled in the coil assembly to secure the air box. Bolt the intake silencer by using one 6x25 screw, a washer and nut.

Flat Screwdriver

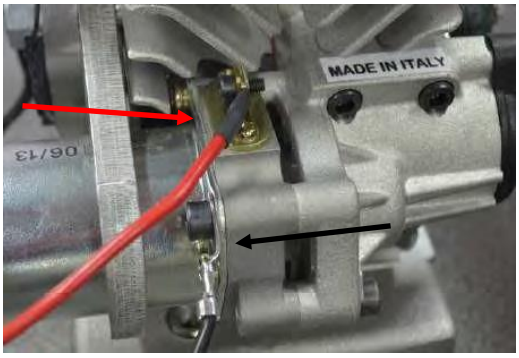
Attach the assembled intake silencer to the adaptor and fix it by using the specific clamp provided.

STARTER ENGINE

3 mm
5 mm Fixed Wrench

Attach the red cable to the electric starter using the screw there is in it.

Unscrew the 5 mm Allen screw. Insert the earth cable (black) plug into the screw and screw firmly.



Cover both cables ends with the plastic covers Attached to the cables.

The engine is now fully assembled and ready to be installed to the chassis

ENGINE RUNNING IN

ENGINE BREAK IN

Only a proper break-in will insure the best performance out of your engine in the future and guarantee its long and trouble-free life. Break-in is required when an engine is new or has undergone a major service of the engine's main parts (piston, cylinder, connecting rod, etc.).

Prepare fuel. Vortex engine works with commercial gasoline, leaded or unleaded, as well as racing fuel, with minimum 95 Octane. Mix Oil and fuel at 4% (i.e. 40cc of oil every 1.000cc of fuel). Use high-quality synthetic oil specifically made for kart engines. Vortex suggests Petronas Rok Lube, however other brands with the same composition might be suitable.
Shake the can thoroughly to mix the fuel and the oil properly. Then fill the gas tank in your kart.


A mistake in measurements could result in engine damage.


Do not accelerate fully but only partially.

Check that the cooling system warms up evenly; in case it warms unevenly proceed again with the bleeding of the cooling system.
Once the engine is warmed up and the cooling system works properly, proceed to the track. Run the engine by alternating RPM's a few seconds on and off the throttle at 3⁄4 maximum throttle.

Do not hold the throttle at a constant speed. Continue this way for 5/6 laps and return to pits. Check everything on the kart is tightening properly.


Be careful, both engine and muffler are hot.
Return to the track and slowly increase the RPM and duration of the acceleration phase for 10/15min more. Intermittently open the throttle fully and then release it.

After 10/15 minutes of brake-in, your engine is ready for competition.


During the break-in, nuts and bolts tend to loosen. Once the engine is cold, check the torque of the exhaust, head, etc.

MAINTENANCE

Good maintenance is essential for safe, economical and trouble-free operation. Here you will find a maintenance schedule for your engine. Routine inspection procedures are very simple by using basic tools. Some service tasks that are more difficult or needs special tools must be performed by Vortex technicians or qualified mechanics.
Timing schedule periods are only indicative. Extreme carburation set ups highly modify timing schedule periods.

Maintenance schedule guide an adjustments

Part	Frequency	Operation
Carburetor	Every race	Cleaning
Accelerator cable	Every race	Check
Spark plug	Every race	Check
Piston	30 hours	Substitution
piston pin	60 liters	Substitution
Piston pin roller cage	60 liters	Substitution
Connection rod	90 hours	Substitution
Crank shaft pin	200 liters	Substitution
Silver washer	200 liters	Substitution
Cylinder	30 hours	Honing
Crank shaft roller cage	200 liters	Substitution
Crank shaft bearings	800 liters	Substitution
Chain	10 hours	Substitution
Clutch	10 hours	Checking and cleaning
	30 hours	Substitution
Exhaust	10 hours	Internal cleaning
Bottom end	90 hours	Re-build

Torque chart

Part	Torque in Nm
Cylinder head nuts	1.8
Crankcase Ø 6 mm screws	1.2
Ignition rotor nut	2.8
Exhaust manifold Ø7mm nut	1.5
Clutch nut	4.5
Bendix cover screw	0.8
Starter gear nut	6 (use tread locker)
Pion bell Ø 5 mm screw	0.8
Ignition Ø5 mm screws	0.8
Nylon crankshaft stuffer	0.8 (use tread locker)

General tolerances

Part	Type	Measure	Operation
Cylinder	Ovalization	0.01	Honing
Piston/cylinder	Clearance	0.08	

Piston types	Sizes Ø in mm
W240/MR01A	41.88
W240/MR03A	41.91
W240/MR06A	41.93
W240/MR09A	41.95
W240/MR11A	41.98

MAINTENEANCE DETAIL CHART

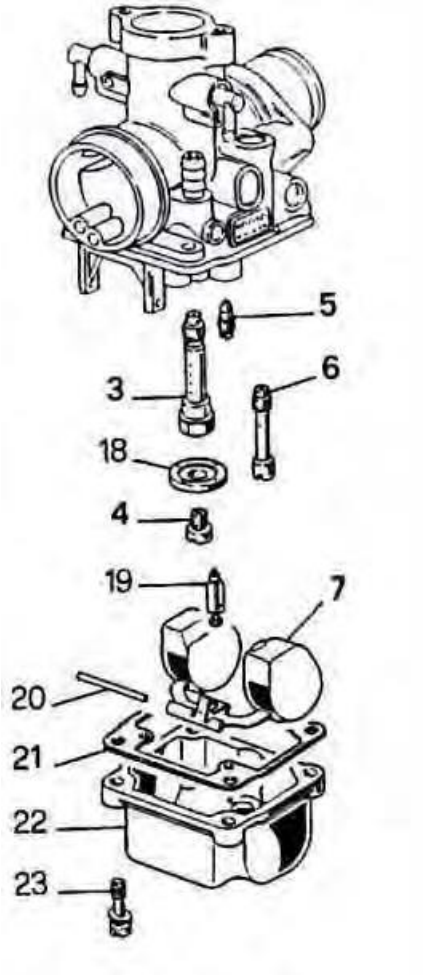
In the following section, you will find a detailed most important maintenance jobs to be performed.

CARBURETOR

Cleaning

Flat Screwdriver

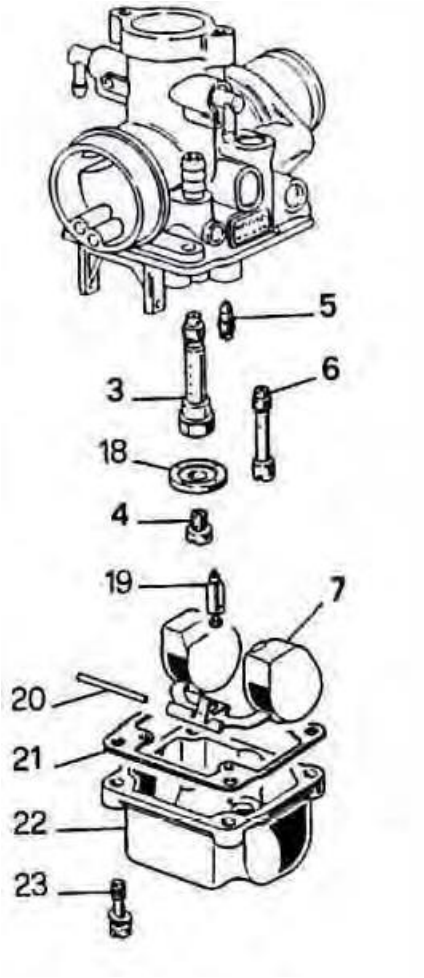
1. Take the intake silencer off the carburetor by unscrewing the clamp. It is **not** necessary to unscrew the bracket. The intake silencer will turn easily.
2. Disconnect the throttle cable from the carburetor together with its spring and slide it.
3. Took the carburetor off the engine and open the float chamber (22) by unscrewing the four screws (23). Clean the parts, openings and passages with compressed air. Check the float chamber gasket (21) and eventually change it if damaged.
4. Close the float chamber by screwing the four screws (23) and re-place the carburetor in the engine.
5. Clean the inside of the intake silencer.
6. Attach the intake silencer assembly to the adaptor.
7. Tighten it with the specific clamp. Wrong assembly will cause the loss of the intake silencer.



Make sure the carburetor is assembled in the right order. A wrong assembly will cause malfunctioning of the carburetor. And could potentially damage the carburetor.

Changing main jet

1. Take the intake silencer off the carburetor by unscrewing the clamp. It is **not** necessary to unscrew the bracket. The intake silencer will turn easily.
2. Disconnect the throttle cable from the carburetor together with its spring and slide it.
3. Took the carburetor off the engine and open the float chamber (22) by unscrewing the four screws (23). Clean the parts, openings and passages with compressed air.
4. Unscrew the main jet (4) by using a cross screwdriver.
Place a new one. Be careful, washer (18) has only one position. Wrong assembling will cause totally black out of carburetor.
5. Check the float chamber gasket (21) and eventually change it if damaged.
6. Close the float chamber by screwing the four screws (23) and re-place the carburetor in the engine.
7. Clean the inside of the intake silencer.
8. Attach the intake silencer assembly to the adaptor.
9. Tighten it with the specific clamp. Wrong assembly will cause the loss of the intake silencer.

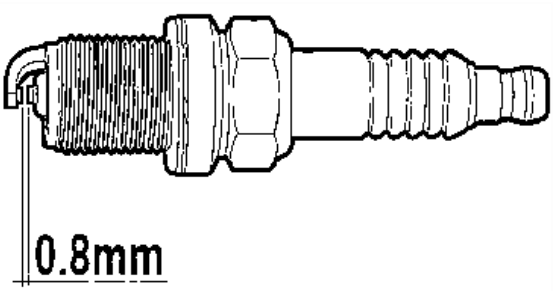


Make sure the carburetor is assembled in the right order. A wrong assembly will cause malfunctioning of the carburetor. And could potentially damage the carburetor.

SPARK PLUG CLEANING AND REPLACEMENT

Sparkplug wrench
Metal Brush

Risk of burning: Perform this task ONLY when engine is cool.



Oils produce carbon deposits or residues that make necessary the spark plug to be checked and cleaned, at least every 5 hours.
Remove the spark plug and clean it by using a brass metal brush.

Use a specific spark plug gap gauge to set up correct gap. Correct gap: **0.8 mm.**
Every 30 hours it is highly recommended to change the spark plug.

EXHAUST CLEANING

Metal Brush
Heater

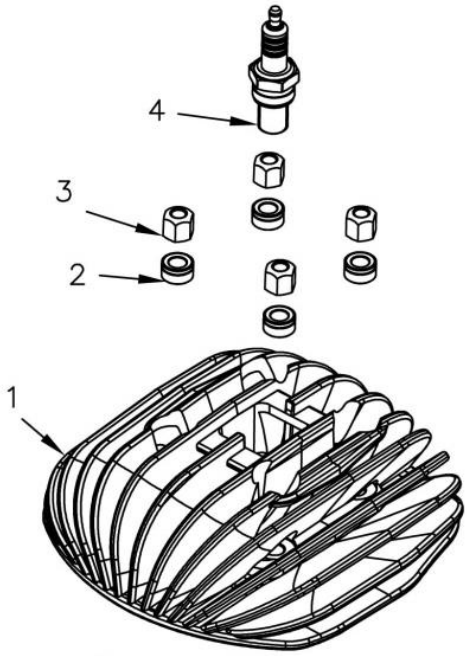
Oils produce carbon deposits or residues that make necessary the exhaust to be checked and cleaned, at least every 10 hours.
Disassemble the exhaust from the engine by removing the two springs and check the exhaust carefully.

Heat the exhaust with a heater and remove all carbon deposits with a metal brush.

CYLINDER HEAD CLEANING

The oil in the fuel pproduces carbon deposits and/or residues that makes it necessary to check the cylinder head at least every race.

Be aware, cylinder head combustion chamber volume may vary during the race. Carbon deposits may cause variations in cylinder head volume.



In order to perform this job, we highly recommend taking the engine off the chassis. However, you may do the job even with the engine mounted.

10mm tube wrench
Torque wrench

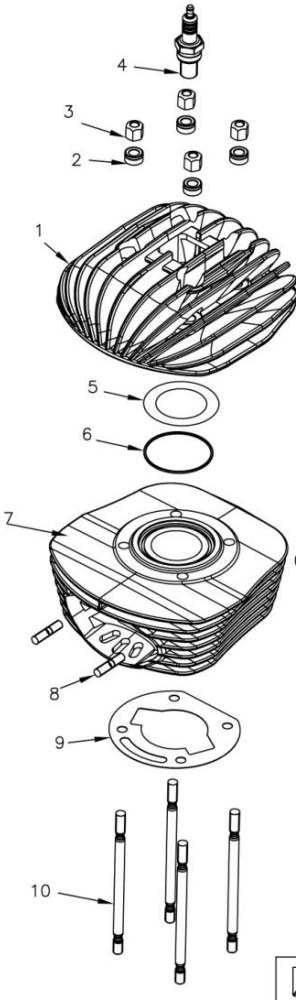
1. Unscrew the spark plug (4).
2. Unscrew the 4 nuts on top of the head (3).
3. Remove the head by pulling it up carefully.
4. Clean the combustion chamber using a rag moistened with gasoline or solvent.

ASSEMBLING
5. Check copper gasket on top of cylinder (5). This gasket may provoke changes in the combustion chamber volume.
6. Re-place cylinder head carefully in the four studs (10).
7. Insert brass washers (2) and nuts (3).
8. Tighten cylinder head with the proper tool and torque.

CYLINDER CHECK AND MAINTENANCE

In order to perform this job, we highly recommend taking the engine off the chassis. However, you may do the job even with the engine mounted.

10mm tube wrench
Torque wrench



1. Take away the muffler from the engine by removing the 2 springs in the cradle and the 2 springs in the exhaust manifold.
2. Remove the carburetor from the engine by unscrewing the specific clamp.
3. Unscrew the 4 nuts on top of head (3).
3. Remove the head by pulling it up carefully.
4. Remove the cylinder with one hand by pulling it up. To avoid contact with the crankcase, use the other hand to hold the connecting rod.

 **Whenever you disassemble the cylinder, we recommend replacing the cylinder gasket** (9).

ASSEMBLING

Check the tolerance between piston and cylinder. Wrong tolerance may cause serious damage.

5. Place a new gasket (9) into the four studs (10).
6. Insert cylinder into the four studs carefully.
7. Check the rubber O.R. (6) and brass gasket (5) and eventually re-place them with new ones. Brass gasket may provoke changes in the combustion chamber volume.
8. Re-place the cylinder head carefully in the four studs.
9. Insert brass washers (2) and nuts (3).
10. Tighten cylinder head with the proper tool and torque.

Important: After honing the cylinder and eventually changing the piston, the engine must go through another break-in period. **See "Starting and Break-in".**

PISTON CHECK AND MAINTENANCE

In order to perform this job, we highly recommend taking the engine off the chassis. However, you may do the job even with the engine mounted.

10mm tube wrench
Torque wrench

1. Take away the muffler from the engine by removing the 2 springs in the cradle and the 2 springs in the exhaust manifold.
2. Remove the carburetor from the engine by unscrewing the specific clamp.
3. Unscrew the 4 nuts on top of head (3).
3. Remove the head by pulling it up carefully.
4. Remove the cylinder with one hand by pulling it up. To avoid contact with the crankcase, use the other hand to hold the connecting rod.

Whenever you disassemble the cylinder, we recommend replacing the cylinder gasket.
5. Remove the 2 piston pin circlips (65) by squeezing the ends together with the needle-nose
6. Hook the connecting rod each side with two fingers
7. Push the piston pin (66) off the piston by using a proper tool.
8. In order to avoid damages pull the piston up with one hand while holding the connecting rod with the other.
9. Take the roller bearing (70) off the connecting rod.

ASSEMBLING

Check the tolerance between piston and cylinder. Assemble ONLY a new piston with the right tolerance. Wrong tolerance may cause serious damage.

10. Grease and place a new roller bearing (70), if needed, on the connecting rod.
11. Insert a new piston in the connecting rod. The arrow marked on top of it, must face the exhaust port.
12. Insert the piston pin into the piston.
13. Insert piston pin circlips on each side of the piston.
Be aware, wrong assembly of piston pin circlips may cause important damage.
14. Place the piston ring in the piston and check both ends close properly against the brass pin inserted in the piston.
15. Place a new gasket (9) into the four studs (10).
16. Insert the cylinder into the four studs carefully.
17. Check the rubber O.R. (6) and the copper gasket (5) and eventually re place them with new ones. Brass gasket may provoke changes in the combustion chamber volume.
18. Re-place the cylinder head carefully in the four studs.
19. Insert brass washers (2) and nuts (3).
20. Tighten cylinder head with proper tool and torque.

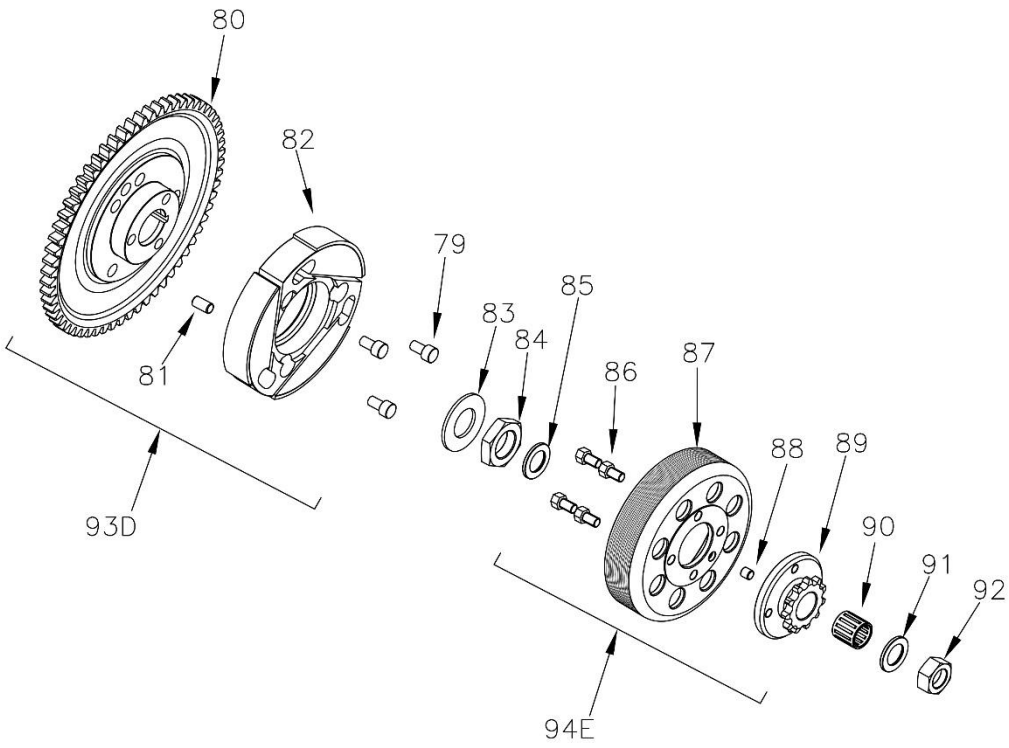
Important: After changing the piston, the engine must go through another break-in period. **See "Starting and Break-in".**

CLEANING AND/OR REPLACING CLUTCH

1. Disassemble the clutch cover.
2. Take away the Bendix cover
3. Stop the clutch drum by using the special tool designed by Vortex for this specific task.
4. Unscrew **anticlockwise** the nut on the clutch drum (92). Remove the washer (91), clutch drum (87) and roller bearing (90).
5. Unscrew the three 6x14mm Allen screws (79) on the clutch.
6. Unscrew **clockwise** the central nut (84) by using a 24mm fixed wrench to remove it. Stop the starter gear with the specific tool manufactured by Vortex.
7. Take away the clutch (82) by using the appropriate extractor.
8. Before assembling the new clutch, we recommend to clean the clutch area and the pinion bell with a solvent.

ASSEMBLING

9. Install the new clutch (82) on the crankshaft by pushing lightly with your fingers and secure it with the three 6x14mm Allen screws (79). Use thread locker to secure them.
10. Put together again the elastic washer (83) and the central nut (84) and tighten. Use thread locker to secure the central nut.
11. After screwing the central nut place the washer (85).
12. Grease the needle bearing (90) totally and insert it on the crankshaft.
13. Place the clutch bell (87), the spacer (91) and screw the nut (92). Use thread locker to secure it.
14. Re-place Bendix cover.
15. Re-place the clutch cover.



REPLACING STARTER GEAR

1. Disassemble the clutch cover.
2. Take away the Bendix cover
3. Stop the clutch drum by using the special tool designed by Vortex for this specific task.
4. Unscrew **anticlockwise** the nut on the clutch drum (92). Remove the washer (91), clutch drum (87) and roller bearing (90).
5. Unscrew **clockwise** the central nut (84) by using a 24mm fixed wrench to remove it. Stop the starter gear with the specific tool manufactured by Vortex.
6. Take away the clutch (82) together with the starter gear (80) by using the appropriate extractor.
7. Unscrew the three 6x14mm Allen screws (79) on the clutch.
8. Before re-assembling, we recommend to clean the area with a solvent.

ASSEMBLING

9. Screw the new starter gear (80) to the clutch (82) by using three 6x14mm Allen screws (79). Use thread locker to secure them.
10. Insert the starter gear and clutch on the crankshaft by pushing lightly with your fingers.
11. Put together again the elastic washer (83) and the central nut (84) and tighten. Use thread locker to secure the central nut.
12. After screwing the central nut place the washer (85).
13. Grease the needle bearing (90) totally and insert it on the crankshaft.
14. Place the clutch bell (87), the spacer (91) and screw the nut (92). Use thread locker to secure it.
15. Re-place Bendix cover.
16. Re-place the clutch cover.

REPLACING PINION

Some ASNs allows the use of Z11 or Z10 pinions. Vortex standard assembling is Z11. Always check the latest updated fish to be sure of the right pinion.

1. Disassemble the clutch cover.
2. Stop the clutch drum by using the special tool designed by Vortex for this specific task.
3. Unscrew **anticlockwise** the nut on the clutch drum (92). Remove the washer (91), clutch drum (87) and roller bearing (90).
4. Unscrew the four bolts inside the drum.
5. Place the new pinion on the bell and secure it with the 4 bolts. Use thread locker to secure them.

Be aware if you are placing a Z10 pinion, a specific spacer is needed.

6. Install roller bearing and the spacer. Grease the roller bearing properly.
6. Re-place the clutch drum, the washer and the nut. Tighten the nut by turning it to the left. Use thread locker to secure it.
7. Re-place the clutch cover.