O.S. ENGINE

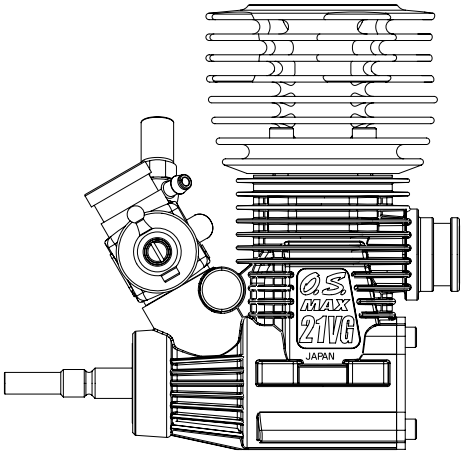
MAX-21VG SERIES

MAX-21VG-P/MAX-21VG-PX
MAX-21VG-P ES

INSTRUCTION MANUAL

It is of vital importance, before attempting to operate your engine, to read the general **'SAFETY INSTRUCTIONS AND WARNINGS'** section on pages 2-5 of this booklet and to strictly adhere to the advice contained therein.

- Also, please study the entire contents of this instruction manual, so as to familiarize yourself with the controls and other features of the engine.
- Keep these instructions in a safe place so that you may readily refer to them whenever necessary.
- It is suggested that any instructions supplied with the vehicle, radio control equipment, etc., are accessible for checking at the same time.



CONTENTS

SAFETY INSTRUCTIONS AND WARNINGS ABOUT YOUR O.S. ENGINE

Remember that your engine is not a "toy", but a highly efficient internal-combustion machine whose power is capable of harming you, or others, if it is misused. As owner, you, alone, are responsible for the safe operation of your engine, so act with discretion and care at all times.
If at some future date, your O.S. engine is acquired by another person, we would respectfully request that these instructions are also passed on to its new owner.

■ **The advice which follows applies basically to ALL MODEL ENGINES and is grouped under two headings according to the degree of damage or danger which might arise through misuse or neglect.**

⚠ WARNINGS

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

⚠ NOTES

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

⚠ WARNINGS

- **Model engine fuel is poisonous. Do not allow it to come into contact with the eyes or mouth. Always store it in a clearly marked container and out of the reach of children.**

- **Model engine fuel is also highly flammable. Keep it away from an open flame, excessive heat, sources of sparks, or anything else which might ignite it. Do not smoke or allow anyone else to smoke, near to it.**

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

- **Model engines generate considerable heat. Do not touch any part of your engine until it has cooled. Contact with the muffler (silencer), cylinder head or exhaust header pipe, in particular, may result in a serious burn.**

⚠ NOTES

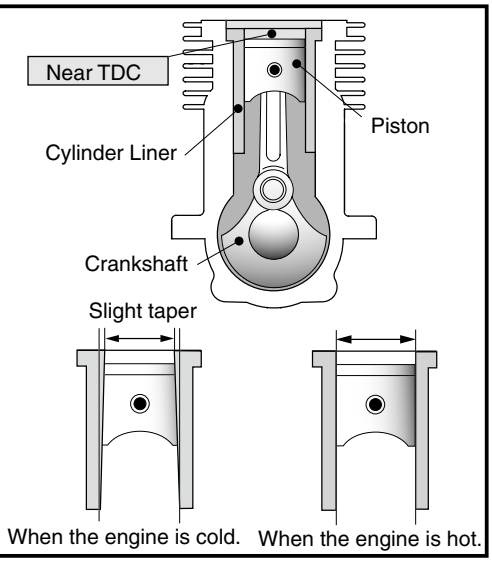
- This engine is intended for model cars. Do not attempt to use it for any other purpose.
- Mount the engine in your model securely, following the manufacturer's recommendations, using appropriate screws and locknuts.
- Install an effective silencer (muffler). Frequent close exposure to a noisy exhaust (especially in the case of the more powerful highspeed engines) may eventually impair your hearing and such noise is also likely to cause annoyance to others over a wide area.
- The wearing of safety glasses is also strongly recommended.
- Take care that the glowplug clip or battery leads do not come into contact with rotating parts. Also check that the linkage to the throttle arm is secure.
- For their safety, keep all onlookers (especially small children) well back (at least 20 feet or 6 meters) when preparing your model for running.
- Before starting the engine, always check the tightness of all the screws and nuts especially those of joint and movable parts such as throttle arm. Missing retightening the loose screws and nuts often causes the parts breakage that is capable of harming you.

⚠ NOTES

- To stop the engine, fully retard the throttle stick and trim lever on the transmitter, or, in an emergency, cut off the fuel supply by pinching the fuel delivery line from the tank.
- Do not attempt to disassemble the recoil starter of the 21VG-PX.
  If you do so, the very strong spring inside will be suddenly ejected. This can be very dangerous.
- Do not extend the starter cord more than 40cm (16"). Do not abruptly release the operating handle. Allow the cord to rewind smoothly while still holding the handle.
- Pull the operating handle straight out when starting the engine, so that the cord does not rub against the vehicle body or engine. This will help prevent the cord from being damaged by abrasion or engine heat.
- Warning! Immediately after a glowplug-ignition engine has been run and is still warm, conditions sometimes exist whereby it is just possible for the engine to abruptly restart if it is rotated over compression WITHOUT the glowplug battery being reconnected.

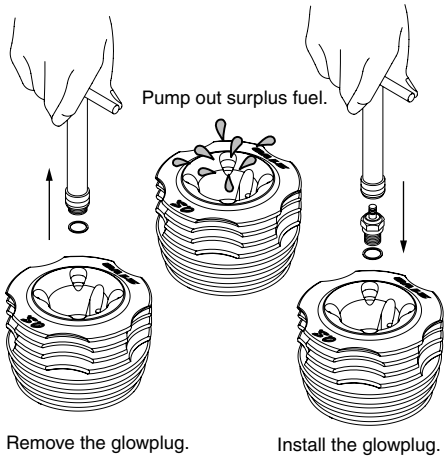
ENGINE CONSTRUCTION

With this engine, the piston will feel tight at the top of its stroke (TDC) when the engine is cold.
This is normal.
The cylinder bore has a slight taper.
The piston and cylinder are designed to achieve a perfect running clearance when they reach operating temperature.



Notes when starting the engine

Do not over-prime.
This could cause a hydraulic lock and damage the engine on application of the electric starter or recoil starter.
If over-primed, remove glowplug, close the needle-valve and apply starter or pull recoil starter to pump out surplus fuel.
Cover the head with a rag to prevent any pumped out fuel from getting into your eyes.



MAX-21VG SERIES INSTRUCTIONS

This manual handles the following three versions.

- MAX-21VG-P (Pilot Shaft) with 21F carburetor
- MAX-21VG-PX with 21F carburetor (Pilot Shaft, with recoil starter)
- MAX-21VG-P ES with 21F carburetor (Pilot Shaft, for Roto Starter)

About pilot shaft

Both engines are equipped with Pilot Shaft crankshafts for use with the Centrax type clutch. These are also known as "SG" shafts.

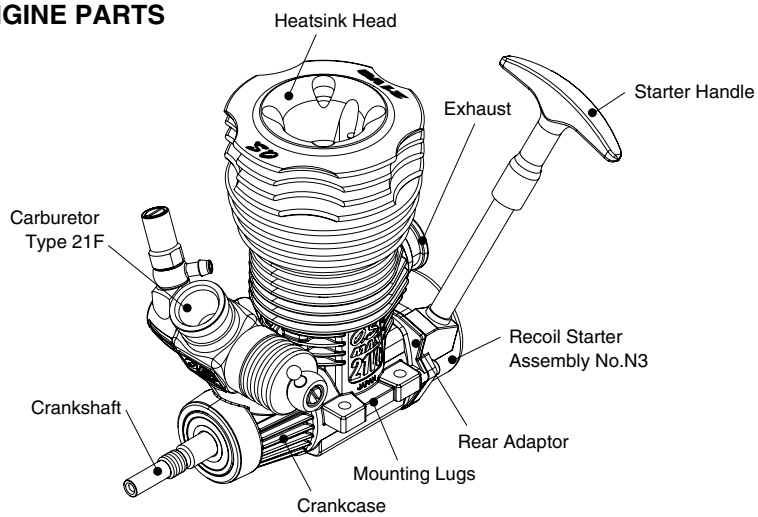
The 21VG Series engines are developed for 1/8 scale R/C cars. They are rear exhaust engines designed for sport use.
For easier handling newly designed 21F carburetor these engines are equipped with a and also a No.8 glowplug is supplied. They have mild and smooth accelerating characteristics which are most suitable for sport runs. Recoil starter incorporated versions which eliminate the need for a separate electric starter and starter battery are also available.

∗ ROTO STARTER is the product name of HPI RACING.

NOTE

As delivered, the engine has its carburetor lightly fit into its intake. Secure it according to the INSTALLATION OF THE CARBURETOR section.

BASIC ENGINE PARTS



MAX-21VG-PX

TOOLS, ACCESSORIES, etc.

The following items are necessary for operating the engine.

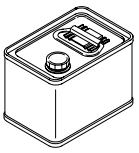
■ Items necessary for starting

FUEL

Generally, it is suggested that the user selects a fuel that is commercially available for model two-stroke engines and contains 10-30% nitromethane.

As a starting point, we recommend a fuel containing 20% nitromethane, changing to a fuel containing more nitro if necessary. When the brand of fuel is changed, or the nitro content increased, it is advisable to repeat the running-in procedure referred to in the RUNNING-IN paragraphs.

Please note that with high-nitro fuels, although power may be increased for competition purposes, glowplug elements do not last as long and engine life will be shorter.



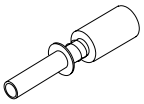
REMINDER!

⚠ **Model engine fuel is poisonous. Do not allow it to come into contact with the eyes or mouth. Always store it in a clearly marked container and out of the reach of children.**

⚠ **Model engine fuel is also highly flammable. Keep it away from open flame, excessive heat, sources of sparks, or anything else which might ignite it. Do not smoke or allow anyone else to smoke, near to it.**

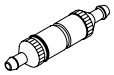
GLOWPLUG IGNITER

Commercialy available handy glowplug heater in which the glowplug battery and battery leads are integrated.



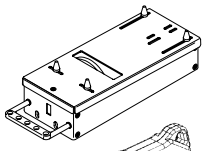
FUEL FILTER

To be installed in the fuel line between fuel tank and carburetor to prevent dust from entering the carburetor.



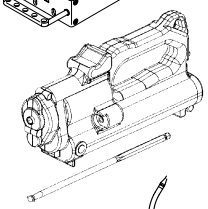
STARTER BOX

For starting the engine.
It is not necessary for 21VG-PX



ROTO START

For starting the 21VG-P ES.

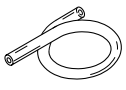


FUEL PUMP

For filling the fuel tank, a simple, poly-ethylene "squeeze" bottle, with a suit-able spout, is required.

SILICONE FUEL LINE

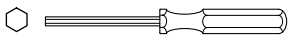
Heatproof silicone tubing of approx. 5mm o.d. and 2mm i.d. is required for the connection between the fuel tank and engine.



■ TOOLS

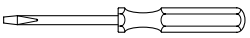
HEX SCREWDRIVER

Necessary for engine installation.
1.5mm, 2mm, 2.5mm, 3mm



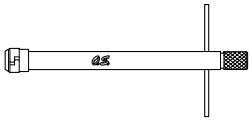
SCREWDRIVER

Necessary for carburetor adjustments.
No.1, No.2, etc



LONG SOCKET WRENCH WITH PLUG GRIP

Recommended for easy removal and replacement of the angled and recessed glowplug, the O.S.Long Socket Wrench incorporates a special grip.



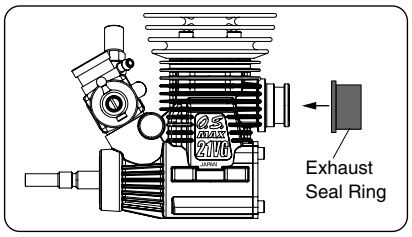
Standard accessories

MAX-21VG-P, MAX-21VG-PX, MAX-21VG-P ES

- Glow Plug No.8 1piece

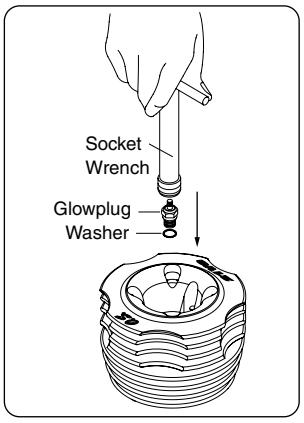
- Exhaust Seal Ring 1piece

■ Install the exhaust seal ring supplied.



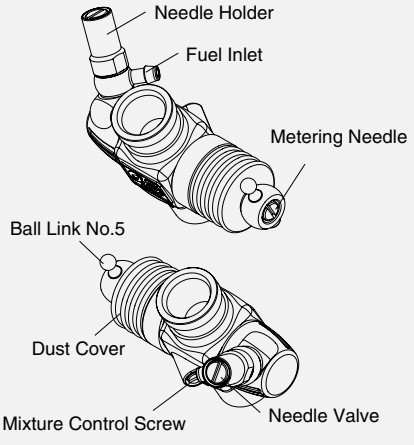
■ INSTALLING THE GLOWPLUG

Fit washer to glowplug and insert carefully into cylinder-head, making sure that it is not cross-threaded before tightening firmly.



CARBURETOR CONTROLS

Carburetor Type 21F



Three adjustable controls are provided on this carburetor.

- **The Needle-Valve(Adjusted at the factory):**
  For adjusting the mixture strength when the throttle is fully open.

- **The Metering Needle (Adjusted at the factory):**
  For adjusting the mixture strength at part-throttle and idle speed, to obtain steady idling and smooth acceleration to mid speed.

- **The Mixture Control Screw (Adjusted at the factory):**
  For setting the idle speed:

NOTE: Readjustment may be necessary, occasionally to allow for changes in fuel formula, gear ratio or clutch engagement point.

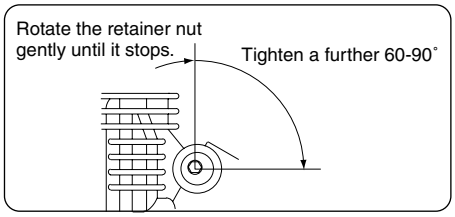
INSTALLATION OF THE CARBURETOR

NOTE

As delivered, the engine has its carburetor lightly fit into its intake. Secure it changing its angle according to the car chassis.

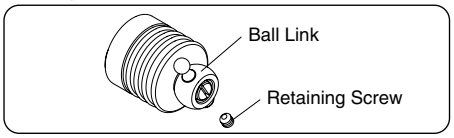
As delivered, the engine has its carburetor lightly fit into the intake boss. Secure it as follows.

1. Loosen the retainer screw, rotate the carburetor to its correct position and make sure that it is pressed well down into the intake boss, compressing the rubber gasket, before retightening the screw.

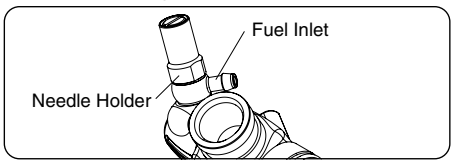


2. Rotate the retainer screw gently until it stops, then tighten a further 60-90˚. Do not overtighten the screw as this will damage the carburetor body.

When changing the ball link direction, loosen the retaining screw with a 1.5mm Hex wrench.



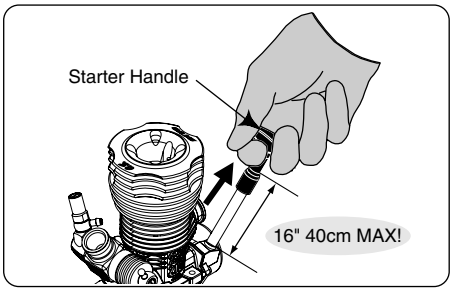
After changed the fuel inlet direction, tighten the needle holder slowly and gently until it stops.
Then, tighten 45~60 degrees further. Do not tighten further or the fuel inlet will be distorted, which may result in fuel leaking.



■ NOTES CONCERNING THE RECOIL STARTER

REMINDER!

- ◆ This will help prevent the cord from being damaged by abrasion or engine heat.
- ◆ Try to avoid spilling fuel over the starter unit and its cord. Some fuels have a detrimental effect on these parts.
- ◆ The starter prevents the engine from being rotated in the wrong direction.The unit will be damaged if you attempt to force the flywheel in the opposite direction (i.e. clockwise when viewed from the crankshaft end).
- ◆ It is suspected that the engine is over-primed when the pulling load is too heavy to pull the starter. In this case, refer to page 7 and TROUBLE SHOOTING about over priming.



⚠ **Do not attempt to disassemble the recoil starter. If you do so, the very strong spring inside will be suddenly ejected. This can be very dangerous.**

⚠ **Do not extend the starter cord more than 40cm (16"). Do not abruptly release the operating handle. Allow the cord to rewind smoothly while still holding the handle.**

⚠ **Pull the operating handle straight out when starting the engine, so that the cord does not rub against the vehicle body or engine.**

GLOWPLUG

Since the glowplug and fuel combination used may have a marked effect on performance and reliability, it would be worthwhile to experiment with different plug types. An O.S. No.8 glowplug is supplied with the engine. Recommended O.S. plugs are the No.8 and A5. Carefully install plug finger-tight, before final tightening with the correct size plug wrench.

The role of the glowplug

With a glowplug engine, ignition is initiated by the application of a 1.5-volt power source. When the battery is disconnected, the heat retained within the combustion chamber remains sufficient to keep the plug filament glowing, thereby continuing to keep the engine running. Ignition timing is 'automatic' : under reduced load, allowing higher rpm, the plug becomes hotter and, appropriately, fires the fuel/air charge earlier; conversely, at reduced rpm, the plug become cooler and ignition is retarded.

Glowplug life

Particularly in the case of very high performance engines, glowplugs must be regarded as expendable items. However, plug life can be extended and engine performance maintained by careful use, i.e.:

- Install a plug suitable for the engine.
- Use fuel containing a moderate percentage of nitromethane unless more is essential for racing events.
- Do not run the engine too lean and do not leave the battery connected while adjusting the needle.

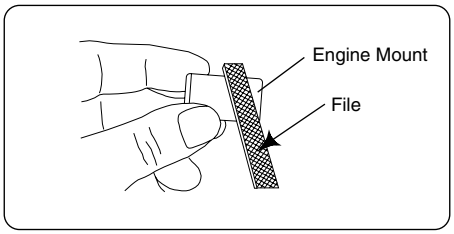
When to replace the glowplug

Apart from when actually burned out, a plug may need to be replaced because it no longer delivers its best performance, such as when:

- Filament surface has roughened and turned white.
- Filament coil has become distorted.
- Foreign matter has adhered to filament or plug body has corroded.
- Engine tends to cut out when idling.
- Starting qualities deteriorate.

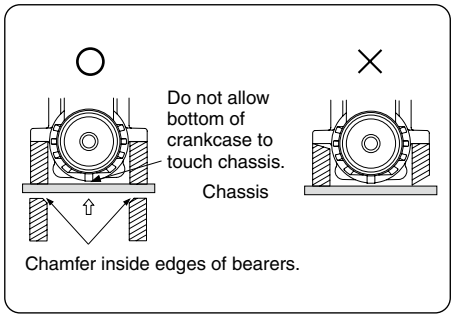
ENGINE INSTALLATION

When installing the engine on the chassis, note the following points.
(Chamfer inside edges of bearers when the engine mount edges interfere with the engine. Do not chamfer the engine.)



Make sure that the vehicle's engine mounting surfaces are level and in the same plane. Poor installation may cause distortion of the crankcase, bearings, etc., resulting in erratic running and loss of performance.

The recommended screws for securing the engine are 3mm or 4-40 steel Allen hexagon socket type.
If existing holes in the engine mount do not align perfectly with engine mounting lugs, enlarge them slightly with a needle-file so that screws are in alignment with the mounting holes.



Chamfer inside edges of bearers.

STARTING THE ENGINE & RUNNING-IN ('Breaking-in)

While Operating

- **Please do not run on a public street, this could cause serious accidents, personal injuries and/or propetry damage.**
- **Please do not run near pedestrians or small children.**
- **Please do not run in small or confined areas.**
- **Please do not run where loud noises can disturb others, such as hospitals and residential areas.**

⚠ **Before starting the engine, always check the tightness of all the screws and nuts especially those of joint and movable parts such as throttle arm. Missing retightening the loose screws and nuts often causes the parts breakage that is capable of harming you.**

RUNNING-IN ('Breaking-in)

Running- in is a procedure for an engine to come close to actual running conditions (fuel, r.p.m., engine temperature, etc.).

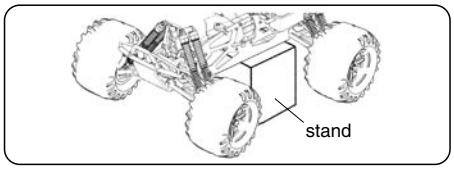
Excessively rich running and prolonged low speed running should be avoided. Prolonged low speed running and low temperature running may result in the oil in the fuel being gelled and piston/liner being stuck together.

PRESSURIZED FUEL SYSTEM

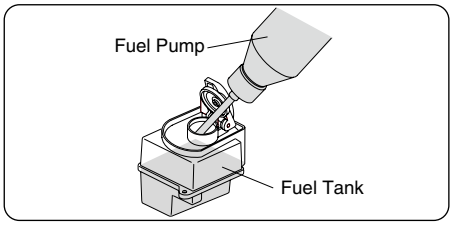
- The somewhat violent changes of vehicle attitude that occur in off-road running, combined with the fact that, in buggy type cars, the fuel tank is often located some distance from the carburetor, means that fuel 'head' at the carburettor can vary and upset running.Therefore,it is recommended that a muffler pressurized fuel feed system be used.
- Never run your vehicle without installing the air cleaner. Dust and dirt that may otherwise be drawn into the engine will rapidly shorten its life.

The following procedure is suitable when a fuel containing up to 30% nitromethane is used.

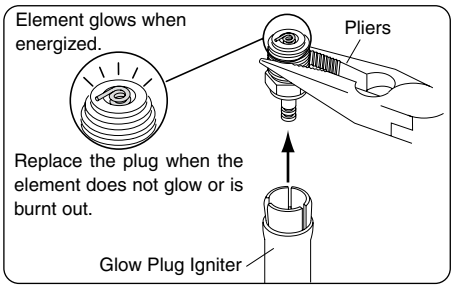
◆ Lay the chassis on a stand and start the engine so that the tires are not in contact with the ground.



◆ Fill the tank completely with fuel.



◆ Temporarily remove the glowplug to check that it glows bright red when energized.



NOTE:

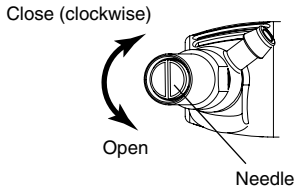
Be careful not to damage the plug threads when holding a glowplug with pliers.

⚠ **Do not hold a glowplug with fingers and use pliers when checking the brightness. Do not have your face close to the glowplug or boiled fuel remaining in the coil will burn you.**

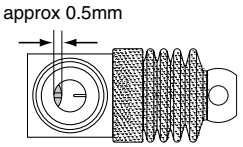
The carburetor is set as shown below at the factory. Start the engine as it is.

- The needle-valve is set approx. 3 turns open from the fully closed position.

Turn the needle-valve clockwise until it stops. This is the fully closed position. Do not force it to turn further.



- Approx. 0.5mm open factory setting



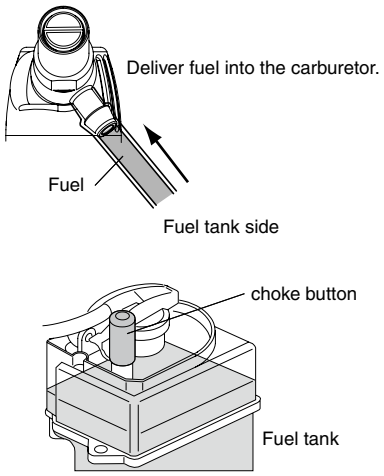
Metering needle is set at basic position.
(Refer to P28.)

Note
Check the throttle opening at idle before installing an air cleaner. After the engine is started, be sure to install an air cleaner.

◆ Switch on the transmitter and make sure that each linkage moves correctly.

◆ If the fuel tank is equipped with a choke button, push the button to send the fuel to the carburetor. If not, apply an electric starter to send the fuel to the carburetor.

Note
If too much fuel is delivered into the engine, the engine cannot be started due to over-priming.
In this case, refer to page 7 and TROUBLE SHOOTING about over-priming.



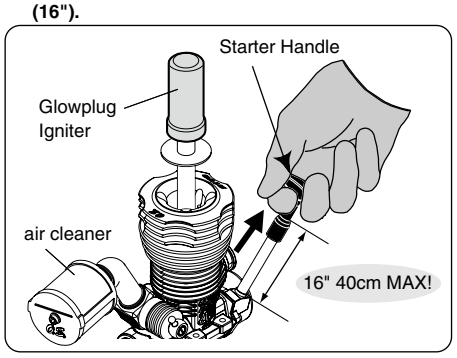
◆Now connect glowplug battery lead to heat the plug filament and start the engine.

■ **In case of the 21VG-PX**

Be sure to install an air cleaner when starting.

Pull the starter handle briskly straight out several times to start the engine.

Do not extend the starter cord more than 40cm (16").



■ **In case of the 21VG-P**

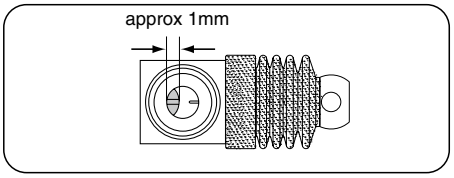
Start the engine using a starter box, making sure the engine rotation direction is correct (counter-clockwise seen from the crankshaft end).

■ **In case of the 21VG-P ES**

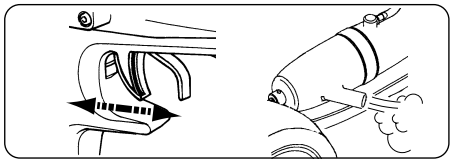
Use the ROTO START to start the engine.

When the engines does not start or stops right after started Try the followings.

- Set the needle-valve approx. 2.5 turns open from the fully closed position. (Do not close further.)
- Set the throttle opening a little wider that the factory set by adjusting the Mixture control screw.



◆When the engine starts, first allow it to operate in short runs at the very rich starting settings, with the glowplug battery still connected and the driving wheels clear of the ground. The rich mixture will, under these conditions, provide adequate lubrication and cooling, indicated by profuse smoke from the exhaust.



Remember!

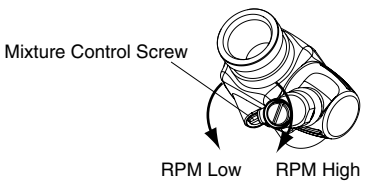
It is vitally important to set the throttle at the correct position before attempting to start the engine. If the engine is allowed to run with the throttle too far open under "no load" conditions, it will rapidly overheat and may be seriously damaged.

■ **Next adjust the idle speed (low engine RPM)**

A correct idle means …

Engine is started but the car does not move when the throttle is positioned neutral.

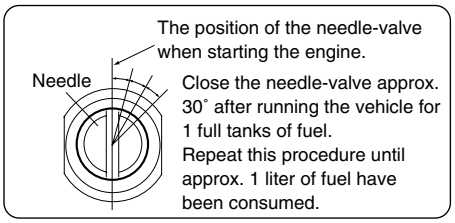
◆Disconnect the glowplug battery If the car starts moving (or tiers rotate), adjust the Mixture control screw so that tiers may not rotate with steady idling.



If the RPM are lowered too much, the engine stops. Set the idle RPM a little higher when the engine is new.

◆Next, disconnect the glowplug battery and try running the car on the track. If the engine stalls, open the throttle fractionally, but try to keep the engine running as rich as possible: if it stops because of being excessively over-rich, close the Needle-Valve 30˚ and try again.

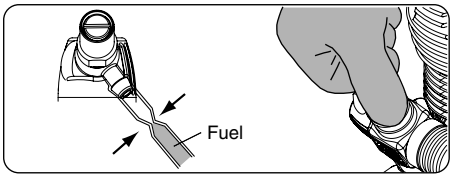
◆Run the car on the track until one tank of fuel has been consumed, then close the Needle-Valve 30˚ and run the car for 1 full tanks of fuel. Repeat this procedure until approx. 2 liter of fuel have been consumed, during which time the throttle may be opened for brief bursts of increased power. If the engine stops at medium speeds, close the Mixture Screw 45˚.



Note:
In the event of any major working parts (e.g. piston/cylinder liner assembly) being replaced or the fuel being changed, especially to high nitro fuel, the complete running-in should be repeated.

■ How to stop the engine

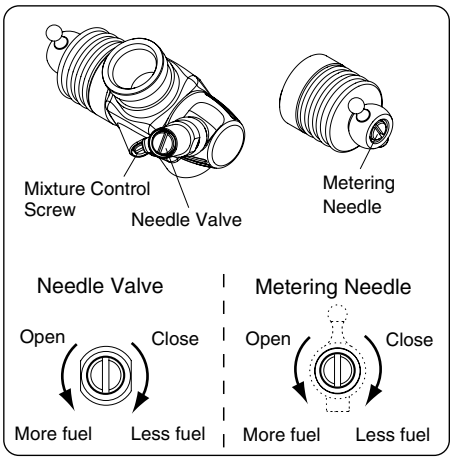
To stop the engine, close the throttle to idle speed and shut it off completely with the trim lever on the transmitter then cut off the fuel supply by pinching the fuel delivery tube to the carburetor.



Warning!
Do not touch rotating parts, engine and silencer when stopping the engine as they become very hot, and contact with them may result in a serious burn.

■FINAL ADJUSTMENT

Final adjustment should be carried out only after the running-in has been completed.



Adjust high RPM running.

◆ Run the vehicle (with throttle fully open) over the longest available straight course, in order to observe the model's speed. Next return the car to the starting point, close the Needle-Valve 30° and repeat the run, taking note of the improvement in performance.

◆ Continue with further runs, gradually reducing the Needle-Valve setting and aiming to achieve the highest straight-line speed. Remember, however, that, if the Needle-Valve is shut down too far, the engine will overheat and, accompanied by visibly diminished exhaust smoke, the model will lose speed. At this point, throttle down immediately, stop the vehicle and reopen the Needle-Valve 45~90°.

Adjust medium and low RPM running.

◆ With the engine running, close the throttle and allow it to idle for about five seconds, then reopen the throttle fully. If, at this point, the engine puffs out an excessive amount of smoke and the vehicle does not accelerate smoothly and rapidly, it is probable that the idle mixture is too rich.
In this case, turn the Metering Needle clockwise 45-90°.

◆ If, on the other hand, the engine tends to speed up momentarily and then cut out abruptly when the throttle is opened, the idle mixture is too lean. Correct this by turning the Metering Needle counter-clockwise 45-90°.

NOTE:

Metering Needle adjustment should be made in steps of not more than 45-90°, carefully checking the effect,on throttle response, of each small adjustment.

◆ Carry out adjustments patiently, under actual running conditions, until the engine responds quickly and positively to the throttle control.

Warning!

Mixture adjustments (whether via the Metering Needle, or the Needle-Valve) cannot be made accurately under 'no-load' conditions, which, in any case, are not advised, since such operation carries the risk of seriously damaging the engine through over-revving and overheating.

◆ With the optimum mixture control position, light smoke is visible during high speed running,and the engine rpm increases smoothly during acceleration. Remember that, if the engine is operated with the fuel/air mixture slightly too lean, it will overheat and run unevenly.
As with all engines, it is advisable to set both the needle-valve and metering needle or Mixture Control Screw slightly on the rich side of the best rpm setting, as a safety measure.

◆ If the engine runs too fast with the throttle closed, the Mixture Control screw should be turned counter-clockwise to allow the throttle opening to be reduced.

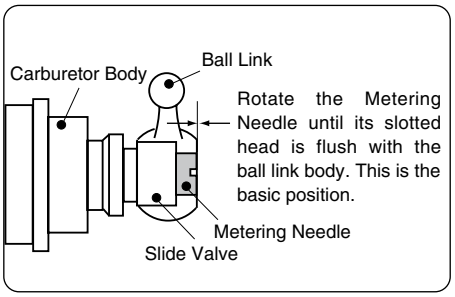
◆ Finally, beyond the nominal break-in period, a slight readjustment toward a leaner needle setting may be required to maintain maximum performance.

NOTE

The above mentioned needle opening is a guide. It varies according to the fuel used and silencer. Usually, when a lower nitro content fuel used, it will be necessary to close the needle-valve.
Do not close the needle-valve too much or rust will be generated and the engine will be damaged.

■ REALIGNMENT OF METERING NEEDLE

In the course of making carburetor adjustments, it is just possible that the Metering Needle and the Mixture Control Screw may be inadvertently screwed in or out too far and thereby moved beyond its effective adjustment range.
The basic positions can be found by rotating the Metering Needle until its slotted head is flush with the ball link body.



Note:
Readjustment of the needle-valve may be necessary to allow for changes in fuel formula, gear ratio, clutch engagement point and muffler. Also, needle setting may vary to atmospheric conditions within the day. Readjust it according to actual engine running.

TROUBLE SHOOTING

Symptom	
Engine fails to fire.	
Cause	**Corrective action**
Fuel tank is empty. Fuel not reaching the engine.	Fill the tank with fuel and repeat Priming procedure.
Glowplug element is burnt out. Glowplug battery discharged	Replace glowplug. Recharge or replace the battery.
Clogged fuel filter Air cleaner and silencer inside is dirty.	Clean or replace fuel filter. Replace cleaner element and clean inside silencer.
Over priming	Remove glowplug and pump out excess fuel.
Fuel tubing is disconnected. Fuel tubing is kinked, split or has a hole.	Connect fuel tubing securely. Check the tubing carefully and replace if necessary.
Incorrect servo linkage	Connect correctly after setting servo at neutral.
Reverse rotating direction of starter box.	Mare sure it rotates counter clockwise seen from crankshaft side.
Recoil starter slips.	Inject cleaner spray into starter cord crevis on the body.

Engine fires intermittently but does not run.	
Cause	**Corrective action**
Insufficient fuel in the tank.	Fill the tank with fuel.
Deteriorated glowplug	Replace glowplug.
Clogged fuel filter Air cleaner and silencer inside is dirty.	Clean or replace fuel filter. Replace cleaner element and clean inside silencer.
Engine overheated	Wait until engine cools.
Incorrect clutch release	Adjust the tension of clutch spring.
Glowplug battery disconnected too soon.	Do not disconnect plug battery and wait until r.p.m. becomes stable.
Air bubbles in fuel	Install O rings to the tank screws to prevent bubbles.

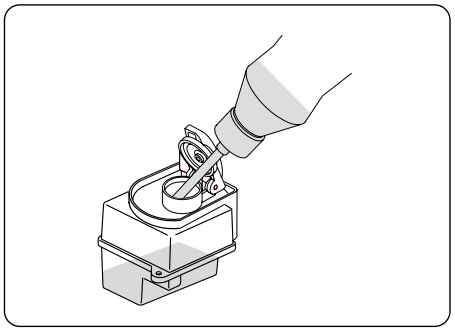
Unstable idle	
Cause	**Corrective action**
Unsuitable glowplug	Use suggested glowplug in the instructions.
Unsuitable fuel	Do not use extremely high nitro or low oil content fuel.
Extremely light flywheel	Add heavier flywheel
Silencer is disconnected or has play	Install silencer securely.
Not reaching expected peak r.p.m.	
Cause	**Corrective action**
Insufficient warming up or running-in.	Set the needle only after warming up. Complete running-in.
Silencer or manifold is not securely connected or disconnected.	Replace seal ring. Check the connections and secure them.
Fuel tubing from tank is split or broken.	Replace the tubing.

Poor response	
Cause	**Corrective action**
Deteriorated glowplug	Replace glowplug.
Incorrect carburetor settings	Readjust low r.p.m. range with metering needle or mixture control screw.
Incorrect setting of transmitter Exponential function.	Check the transmitter setting.
Incorrect linkage	Make sure the throttle servo linkage does not bind and is connected correctly.
Poor r.p.m. drop	
Cause	**Corrective action**
Throttle position open too far.	Close the mixure control screw to adequate position to lower idle r.p.m.
Carburetor not fully seated	Install carburetor securely.
Metering needle closed too far.	Open the metering needle a little.

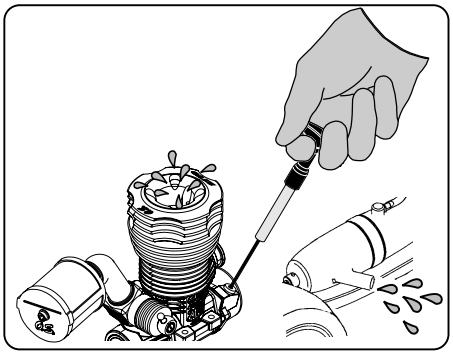
CARE AND MAINTENANCE

Care and maintenance after the running is very important. Be sure to carry out the following procedures.

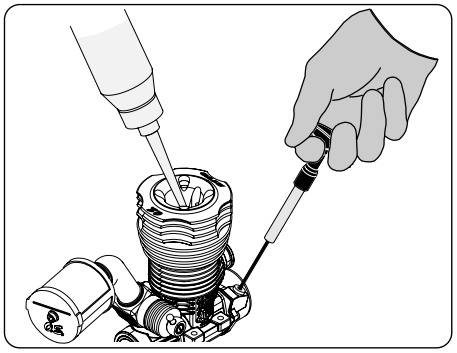
◆Do not forget to clean the filters regularly to remove dirt and lint that accumulate on the filter screens. Also, clean the carburetor itself occasionally.



◆At the end of each operating session, drain out any fuel that may remain in the fuel tank. Afterwards,energize the glow-plug and try to restart the engine, to burn off any fuel that may remain inside the engine. Repeat this procedure until the engine fails to fire. Do this while the engine is still warm.



◆ Then, inject some after-run oil into the engine, and rotate the engine with an electric starter or the recoil starter for 4 to 5 seconds to distribute the oil to all the working parts.



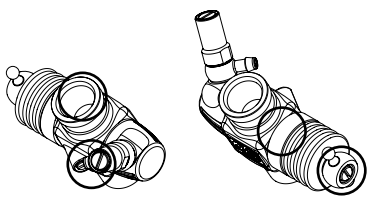
Note:

Do not inject after-run oil into the carburetor as this may cause the O-rings inside the carburetor to deteriorate. These procedures will reduce the risks of starting difficulties or corrosion after a period of storage.

■ Finally, when cleaning the exterior of the engine, use methanol. Do not use gasoline or any solvent that might damage the silicone fuel tubing.

The minute particles of foreign matter, that are present in any fuel may, by accumulating and partially obstructing fuel flow, cause engine performance to become erratic and unreliable.
O.S. 'Super-Filters' (large and small) are available, as optional extras, to deal with this problem.
One of these filters installed to the pickup tube inside your refueling container, will prevent the entry of foreign material into the fuel tank. It is also recommended that a good in-line filter be installed between the tank and carburetor.

Dirt and dust may lodge in ◯ marked places.



■ CHECKING THE ENGINE

If the engine suffers a loss of performance after a long period of running it may be due to the wearing of parts. It is suggested that the worn parts be replaced when the following symptoms are detected.

◆ Engine sound changes and easily overheats.

◆ Power has dropped considerably.

◆ Idle is unstable and/or engine tends to stop at idle.

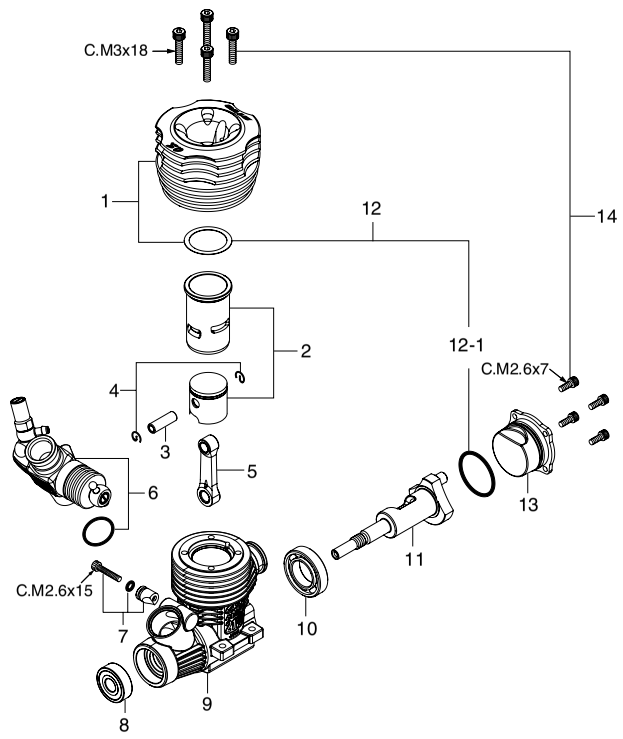
In most cases, ball bearings, cylinder & piston assembly, connecting rod and/or crankcase have become worn out or abnormal. Check the parts carefully and replace them if necessary.

O.S.ENGINE 21VG-P ENGINE PARTS LIST

No.	Code No.	Description
1	23604100	Heatsink Head
2	23613000	Cylinder & Piston Assembly
3	23906000	Piston Pin
4	21817000	Piston Pin Retainer (2pcs.)
5	23605010	Connecting Rod
6	23618030	Carburetor Complete (Type 21F)
7	23618171	Carburetor Retainer Assembly
8	23731000	Crankshaft Ball Bearing (Front)
9	23611000	Crankcase
10	23430000	Crankshaft Ball Bearing (Rear)
11	23612000	Crankshaft
12	23614100	Gasket Set
12-1	23764020	Cover Gasket
13	23617000	Cover Plate
14	23763010	Screw Set
	71608001	Glow Plug No.8
	22826140	Exhaust Seal Ring

The specifications are subject to alteration for improvement without notice.

O.S.ENGINE 21VG-P ENGINE EXPLODED VIEW



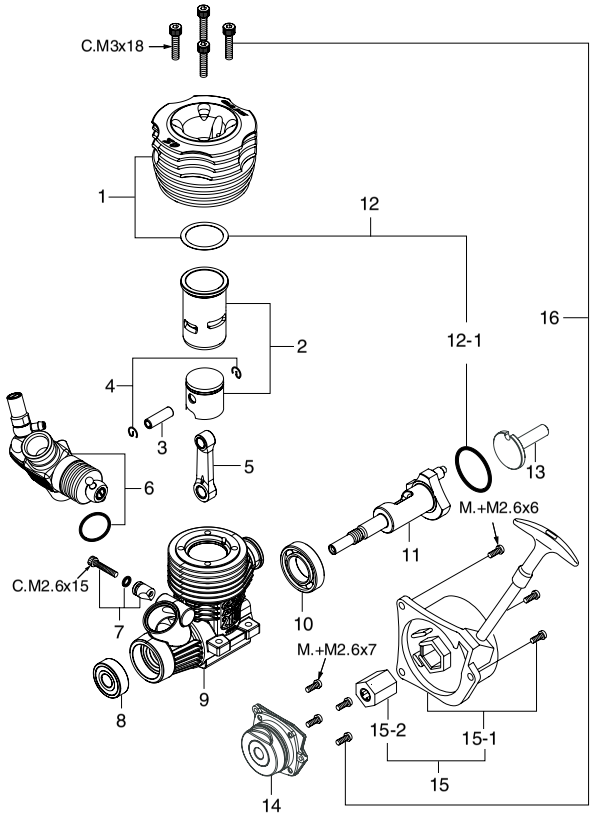
✻Type of screw
C...Cap Screw M...Oval Fillister-Head Screw
F...Flat Head Screw N...Round Head Screw S...Set Screw

O.S.ENGINE 21VG-PX ENGINE PARTS LIST

No.	Code No.	Description
1	23604100	Heatsink Head
2	23613000	Cylinder & Piston Assembly
3	23906000	Piston Pin
4	21817000	Piston Pin Retainer (2pcs.)
5	23605010	Connecting Rod
6	23618030	Carburetor Complete (Type 21F)
7	23618171	Carburetor Retainer Assembly
8	23731000	Crankshaft Ball Bearing (Front)
9	23611000	Crankcase
10	23430000	Crankshaft Ball Bearing (Rear)
11	23612010	Crankshaft
12	23614100	Gasket Set
12-1	23764020	Cover Gasket
13	23612050	Starting Shaft
14	23611800	Rear Adaptor
15	73009000	No.N3 Recoil Starter Assembly
15-1	73009100	No.N3 Recoil Starter Body
15-2	73008200	One-way Clutch
16	23911300	Screw Set
	71608001	Glow Plug No.8
	22826140	Exhaust Seal Ring

The specifications are subject to alteration for improvement without notice.

O.S.ENGINE 21VG-PX ENGINE EXPLODED VIEW



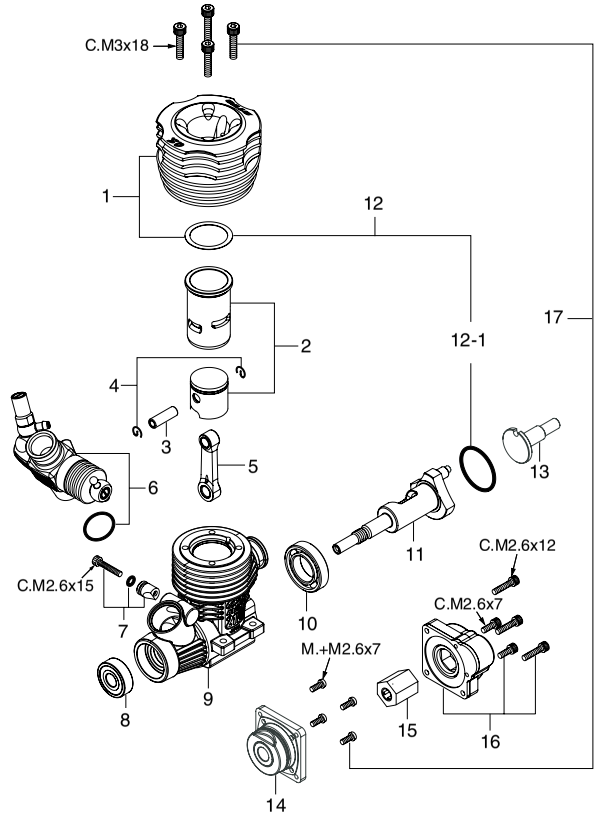
*Type of screw
C...Cap Screw M...Oval Fillister-Head Screw
F...Flat Head Screw N...Round Head Screw S...Set Screw

O.S.ENGINE 21VG-P ES ENGINE PARTS LIST

No.	Code No.	Description
1	23604100	Heatsink Head
2	23613000	Cylinder & Piston Assembly
3	23906000	Piston Pin
4	21817000	Piston Pin Retainer (2pcs.)
5	23605010	Connecting Rod
6	23618030	Carburetor Complete (Type 21F)
7	23618171	Carburetor Retainer Assembly
8	23731000	Crankshaft Ball Bearing (Front)
9	23611000	Crankcase
10	23430000	Crankshaft Ball Bearing (Rear)
11	23612010	Crankshaft
12	23614100	Gasket Set
12-1	23764020	Cover Gasket
13	23912210	Starting Shaft (For Roto Start)
14	23917210	Rear Adaptor (For Roto Start)
15	73008200	One-way Clutch
16	73009200	ES Starter Assembly
17	23911300	Screw Set
	71608001	Glow Plug No.8
	22826140	Exhaust Seal Ring

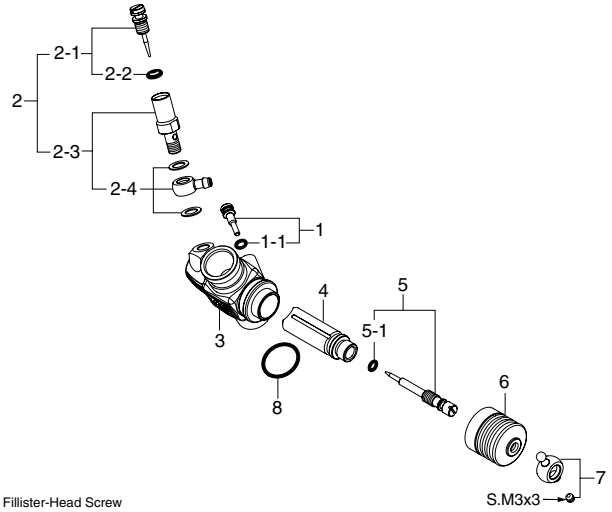
The specifications are subject to alteration for improvement without notice.

O.S.ENGINE 21VG-P ES ENGINE EXPLODED VIEW



*Type of screw

C...Cap Screw M...Oval Fillister-Head Screw
F...Flat Head Screw N...Round Head Screw S...Set Screw



✻Type of screw
C...Cap Screw M...Oval Fillister-Head Screw
F...Flat Head Screw N...Round Head Screw S...Set Screw

No.	Code No.	Description
1	22848160	Mixture Control Screw
1-1	27881820	"O" Ring (2pcs.)
2	23618190	Needle Valve Assembly
2-1	23618197	Needle Assembly
2-2	46066319	"O" Ring (2pcs.)
2-3	23619194	Needle Holder Assembly
2-4	23818176	Fuel Inlet
3	23618130	Carburetor Body
4	23981210	Slide Valve
5	23981510	Metering Needle Assembly
5-1	27881820	"O" Ring (2pcs.)
6	23981520	Dust Cover
7	23781400	Ball Link (No.3)
8	29015019	Carburetor Rubber Gasket

The specifications are subject to alteration for improvement without notice.

■ **O.S. Glow Plug**

- **No.8** (71608001)
- **A5** (71605100)

■ **M2000 Exhaust Header Pipe Assembly** (72106430)

- Header Pipe Spring (2pcs.) (72101272)
- Exhaust Seal Ring (2pcs.) (22826140)

■ **M2000SC Exhaust Header Pipe Assembly** (72106440)

- Header Pipe Spring (2pcs.) (72101272)
- Exhaust Seal Ring (2pcs.) (22826140)

■ **T-2060WN Tuned Silencer Assembly** (72106090)

■ **T-2060SC WN Tuned Silencer Assembly** (72106130)

- Exhaust Seal Ring (2pcs.) (22826140)
- Joint Spring (3pcs.) (72106042)

■ **T-2060SC WN Complete Set** (72106135)

- T-2060SC WN Tuned Silencer Assembly (72106130)
- M2000SC Exhaust Header Pipe Assembly (72106440)

■ **Exhaust Seal Ring** (2pcs.) (22826140)

■ **SUPER JOINT TUBE 21** (72106300)

■ **T-2070 Tuned Silencer** (72106120)
Joint tube type (For 21-30)

■ **Super Air Cleaner 202** (72412000) On-road Type

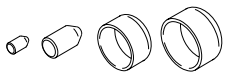
- **202 Cleaner Body** (72412100)
- **202 Filter Element (4pcs.)** (72412200)

■ **SUPER AIR CLEANER 203** (72413000) Off-road Type

- **203 Filter Element (4pcs.)** (72413200)

■ **Dust Cap Set**

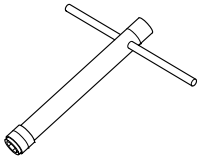
- ⌀**3** (5pcs.) (73300305)
- ⌀**8** (3pcs.) (73300812)
- ⌀**16** (3pcs.) (73301612)
- ⌀**18** (3pcs.) (73301812)



■ **Cap Screw Set** (10pcs.)

- **M2.6x7** (79871020)
- **M2.6x15** (79871050)
- **M2.6x12** (79871040)
- **M3x18** (79871180)

■ **Long Socket Wrench With Plug Grip** (71521000)

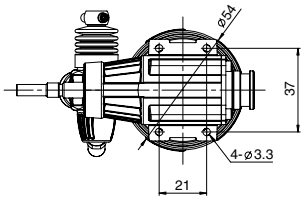


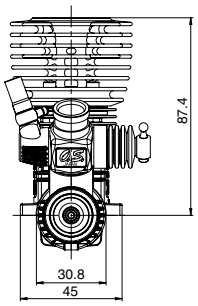
The specifications are subject to alteration for improvement without notice.

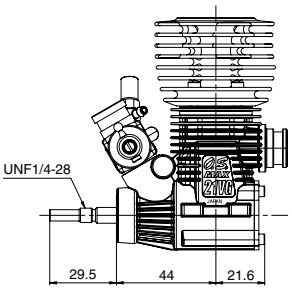
21VG-P THREE VIEW DRAWING

SPECIFICATIONS

■ Displacement	3.46 cc (0.211 cu.in.)
■ Bore	16.6 mm (0.654 in.)
■ Stroke	16.0 mm (0.63 in.)
■ Practical R.P.M.	3,000-36,000 r.p.m.
■ Power output	2.0 ps / 30,000 r.p.m.
■ Weight	347 g (12.24 oz.)





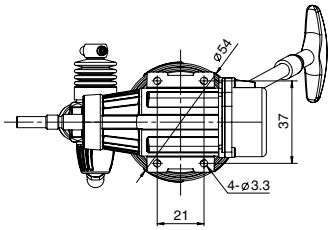


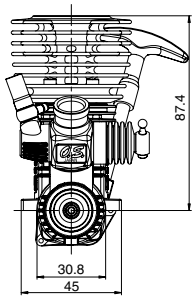
Dimensions (mm)

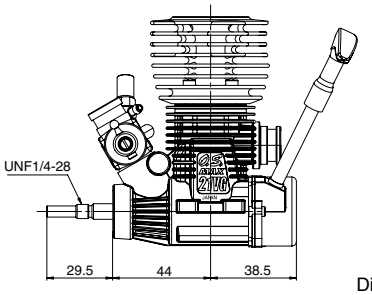
21VG-PX THREE VIEW DRAWING

SPECIFICATIONS

■ Displacement	3.46 cc (0.211 cu.in.)
■ Bore	16.6 mm (0.654 in.)
■ Stroke	16.0 mm (0.63 in.)
■ Practical R.P.M.	3,000-36,000 r.p.m.
■ Power output	2.0 ps / 30,000 r.p.m.
■ Weight	395 g (13.93 oz.)





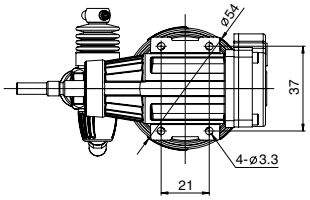


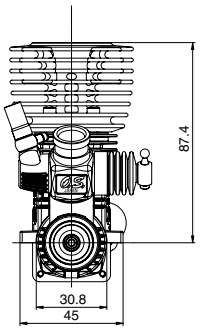
Dimensions (mm)

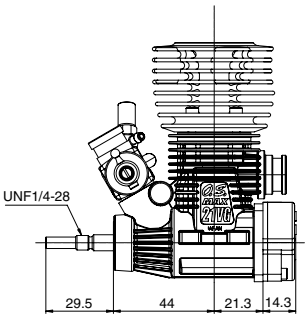
21VG-P ES THREE VIEW DRAWING

SPECIFICATIONS

■ Displacement	3.46 cc (0.211 cu.in.)
■ Bore	16.6 mm (0.654 in.)
■ Stroke	16.0 mm (0.63 in.)
■ Practical R.P.M.	3,000-36,000 r.p.m.
■ Power output	2.0 ps / 30,000 r.p.m.
■ Weight	433 g (15.27 oz.)







Dimensions (mm)

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