INSTRUCTIONS FOR
O.S. MAX-46VX-M & MAX-46VX-M(ST) ENGINES

It is of vital importance, before attempting to operate your engine, to read this 'SAFETY INSTRUCTIONS AND WARNINGS' leaflet and to strictly adhere to the advice contained herein. Also, please read through the instruction leaflet or manual supplied with the engine, so as to familiarize yourself with the controls and other features of the engine.

Keep this leaflet and the engine instructions in a safe place so that you may readily refer to them whenever necessary. It is suggested that any instructions supplied with the aircraft, radio-control equipment, etc., are accessible for checking at the same time.

INDEX

SAFETY INSTRUCTIONS AND
WARNINGS ABOUT YOUR O.S. ENGINE ........................................1

NAMES OF ENGINE PARTS, INSTALLATION,
SILENCER, GLOW PLUGS, FUEL,
PROPELLER, CYLINDER HEAD GASKET ........................................2

STARTING, ADJUSTING THE CARBURETOR,
RUNNING-IN, CARE AND MAINTENANCE, GUARANTEE ..................3

CARBURETOR EXPLODED VIEWS, PARTS LIST .................................4

SPECIFICATIONS
Displacement 7.45cc (0.455cu.in.)  Practical R.P.M. 2,500-28,000 r.p.m.
Bore 22.0mm (0.866in.)  Power output 2.5PS/23,000r.p.m.
Stroke 18.6mm (0.732in.)  Weight 445g (15.6oz.)

(glowplug, joint, flywheel and exhaust header shown are optional extra.)

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 or abused.

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 is grouped under two headings according to the degree of danger or danger which might arise through misuse or neglect.

⚠️ WARNING危险 Cover events which might involve serious (in extreme circumstances, even fatal) injury.

⚠️ NOTE注意 Cover the many other possibilities, generally less obvious sources of danger, but which, under certain circumstances, may also cause damage or injury.

⚠️ WARNING危险

* Never touch, or allow any object to come into contact with, the rotating propeller.

* 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 naked 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 engine 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.

⚠️ NOTE注意

* This engine was designed for model boat. Do not attempt to use it for any other purpose.

* Mount the engine in your model securely, following the manufacturers recommendations, using appropriate screws and locknuts.

* Fit an effective silencer (muffler). Frequent close exposure to a noisy exhaust (especially in the case of the most powerful high-speed engines) may eventually impair your hearing and such noise is also likely to cause annoyance to others over a wide area.

* For their safety, keep all onlookers (especially small children) well back (at least 12 feet or 4 metres) when preparing your model for running.

* Take care that the glowplug clip or battery leads do not come into contact with the propeller or any other rotating parts. Also check the linkage to the throttle arm.

* When starting your engine, use an electric starter. The wearing of safety glasses is also strongly recommended.

* When you carry the model after starting the engine, be especially cautious. Keep the propeller and other rotating parts away from you.

* Adjust the throttle linkage so that the engine stops when the throttle stick and trim lever on the transmitter are fully retarded. Alternatively, the engine may be stopped by cutting off the fuel supply. Never try to stop the engine physically.

* 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 the glowplug battery being reconnected.
The MAX-46VX-M and 46VX-M(ST) are high-performance engines designed strictly for power boat racing. The MAX-46VX-M(ST) is especially designed to use the straight fuel, while the MAX-46VX-M is designed to use the fuel containing nitromethane - i.e. the only difference between two versions is difference of combustion chamber shape.

**CATIONS**

- This engine is designed for power boat racing experts, not for beginners who are not familiar with the handling of the power boat racing engine.
- We do not recommend running your boat on the seas, or in any other salt-water environment. Under such conditions, it is difficult to prevent the engine from becoming corroded and, eventually, inoperative.

**NAMES OF ENGINE PARTS**

- Water Cooled Head
- Water Cooled Exhaust Header (optional extra)
- Crankcase
- Joint (optional extra)
- Beam Mount
- Needle Valve
- Fuel Inlet
- Carburator Type 40A
- Crankcase
- Beam Mount
- Throttle Lever
- Mixture Control Valve (Mixture Control Screw)

**INSTALLATION**

- Make sure that the engine sits squarely in the engineline or mount. If necessary, trim or modify the mount (see sketch) so that only the under-surfaces of the engine's mounting lugs are in contact with the bearing surfaces. Poor installation may not only cause erratic running and loss of power, it may also damage the engine itself by distorting the crankcase, bearings, etc.
- For the highest performance, we recommend that the engine mount and its surroundings are as heavy and as rigid as possible.
- Make sure that the engine bearers are parallel and that their mounting surfaces are in the same plane. Use 3mm steele screws, such as Allen type, with locknuts, for bolting the engine to the bearers. If the holes in the mounting bearers do not align perfectly with the engine's mounting lugs, enlarge them slightly with a needle file so that the fixing screws go in perfectly. In this case, make sure that no filings, or other foreign matter, are allowed to enter the engine or the carburetor.

- The distance between the carburetor air intake and any bulkhead near the engine should be at least 15m (0.95), otherwise the induction efficiency will be reduced.
- Clean the model's "engine room" before installing the engine, in order to eliminate the risk of foreign matter such as sandpaper residue, glass wool, dust, etc., becoming drawn through the carburetor.

**SILENCER**

As these racing type O.S. marine engines have been designed primarily for use with a tuned length exhaust silencer system, a conventional silencer is not supplied. Any of the tuned silencers currently available for 65 to 90 cu. in. engines may be used. Silicone tubing may be employed to connect the silencer to the exhaust header or pipe. However, remember that, if silicone tubing is exposed directly to exhaust gases, it will deteriorate much more quickly. Therefore, when using exhaust length to required operating r.p.m., try to limit any exposed length of silicone tubing between the exhaust silencer and silencer, to not more than 3.5mm (or 1.8-3/16) in.

**FUEL (IN CASE OF CONTAINING NITROMETHANE)**

Use only top quality model two-stroke engine fuel containing not less than 18% lubricant. These engines can be run on either low or high nitromethane content fuels, i.e. from mild mixtures containing a few percent of nitromethane, up to high-speed racing fuels containing 40%, or more, of nitromethane. Generally, power output is increased - up to a certain point - as the nitromethane content of the fuel containing more nitro if necessary. When the nitro content of the fuel is increased. As a starting point, we recommend a fuel containing 10-20% nitromethane, changing to a fuel is increased or the blend of fuel is changed, it is advisable to run the engine with a rich needle-valve setting, initially, so that the optimum setting for the new fuel may be reached as described in the RUNNING PARAGRAPH. Please note that, with high-nitro fuels, although power may be increased for competition purposes, glowplug elements do not last so long and engine life will be shortened.

**PROPELLERS**

Suggested propellers are shown in the table.

<table>
<thead>
<tr>
<th>For Deep Veas</th>
<th>For Hydroplanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter(mm)</td>
<td>P/D ratio</td>
</tr>
<tr>
<td>48-50</td>
<td>1.0-1.3</td>
</tr>
<tr>
<td>50-58</td>
<td>1.4-1.8</td>
</tr>
</tbody>
</table>

**CYLINDER HEAD GASKET**

<table>
<thead>
<tr>
<th>ENGINE</th>
<th>Nitromethane content</th>
<th>Head gasket</th>
</tr>
</thead>
<tbody>
<tr>
<td>46VX-M(ST)</td>
<td>STRAIGHT (0%)</td>
<td>STRAIGHT</td>
</tr>
<tr>
<td></td>
<td>(D/W=1, D=1, T=1)</td>
<td>Summer time</td>
</tr>
<tr>
<td></td>
<td>ONE (B, T)</td>
<td>Winter time</td>
</tr>
<tr>
<td>46VX-M</td>
<td>MORE THAN 40%</td>
<td>ONE (B, 1, T)</td>
</tr>
<tr>
<td></td>
<td>LESS THAN 40%</td>
<td>ONE (B, T)</td>
</tr>
</tbody>
</table>

It may be necessary to lower the compression ratio when a tuned silencer is set at high-tune (e.g. in heat race), or if glowplugs tend to burn out repeatedly. In such cases, the fitting of an extra cylinder head gasket is recommended.

**STARTING**

- Set the needle-valve. Turn the needle-valve clockwise slowly, without forcing until it stops. Then, turn the needle-valve 1-1/2 turns counter-clockwise.
- Open the throttle.

- Heat the glowplug. Connect the battery leads.
- Starting the engine
  Fill a starter belt at the flywheel groove and starter cone groove. Depress the starter switch and immediately pull up the starter so that the belt may come into contact with the flywheel. When the engine fires, release the starter from the belt immediately.

**ATTENTION**

- If you apply the starter with the engine flooded or placing your finger over the carburetor intake, the connecting rod may bend and damage the engine.
- Adjusting the needle-valve
  Adjust the needle-valve to an optimum setting while actually running your model.
- How to stop the engine
  Close the throttle fully to cut off air supply.
ADJUSTING THE CARBURETTOR

- This carburettor is not provided with a screw for setting the throttle opening at the idling position. Instead, the throttle is set up as follows:
- Connect the throttle lever linkage so that the throttle rotor is (a) fully open when the transmitter throttle stick is fully advanced and (b) fully closed when the throttle stick is fully retarded.
- Adjustment of the throttle rotor opening at the idling position can then be made with the throttle trim lever on the transmitter.
- Advance the throttle trim lever so that the throttle rotor opens approximately 1mm from the fully closed position as set.
- Set the needle-valve 1/2 turns (depending on the size of the engine and type of fuel) open from the fully closed position, and start the engine.

WARNING:
When a watercooled marine engine is started on shore avoid running it at high r.p.m. without load, either by keeping the throttle in the idling position, or by opening the needle-valve to reduce speed. Although the engine is designed to run at high r.p.m. even when new, such components as the cylinder, piston, connecting-rod, etc. will be seriously damaged if they are allowed to become overheated.

2. Put the boat on the water before opening throttle and then adjust the Needle-Valve for the approximate best setting.

3. The Mixture Control Screw is for adjusting fuel mixture strength at part throttle and idling speeds. Having set the needle-valve as detailed above, close the throttle. The engine should idle continuously and steadily. (If it stops immediately, first by advancing the throttle trim lever on the transmitter to raise the idling speed a little.)

(a) If, however, the engine idles unevenly and hesitantly when the throttle is re-opened, it is probable that the idling mixture is too rich. Check this by closing the throttle again and re-opening it after about 10 seconds. If the engine now pulls out a good deal of smoke or hesitates, it will be necessary to close the Mixture Control Screw. Therefore, turn it a few degrees clockwise. (Turn the Mixture Control Screw in steps of about 20 degrees only, re-checking the running qualities each time.)

(b) If, instead of being set too rich, the Mixture Control Screw is set too lean, the engine will stop when the throttle is closed, or will lose speed while idling and then cut out abruptly (without smoking) when the throttle is opened again. In this case, turn the Mixture Control Screw counter-clockwise.

Mixture Control Screw adjustment is not critical and, by remembering the symptoms of rich and lean running quoted above, it is a simple matter to establish the best setting.

The correct mixture for part-throttle (medium speed) running is automatically controlled by the Mixture Control Screw when it has been adjusted to the best idling setting.

4. If, after carrying out mixture adjustments, the idling speed is found to be too high, the throttle trim lever should be moved downward until the desired idling speed is achieved.

Note:
Once the correct carburettor settings have been established, it should be unnecessary to alter them. Such slight needle-valve adjustments as may be required to cope with variations in atmospheric conditions, will not normally affect the other controls. A small readjustment may be required if the fuel and/or plug are changed to different types.

REALIGNMENT OF MIXTURE CONTROL SCREW

The Mixture Control Screw is factory set at the approximate best position. If, however, the Mixture Control Screw has been tampered with, or moved accidentally, set it at the original position as follows. Screw in the Mixture Control Screw until stops while keeping the rotor fully closed. Then, unscrew 2 1/2 turns. This is the original position of the Mixture Control Screw.

CARBURETTER CLEANLINESS

The minute particles of foreign matter, that are present in any fuel-can, 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, fitted to the outlet 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 carburettor. Do not forget to clean the filters regularly to remove dirt and lint that accumulate on the filter screens. Also, clean the carburettor itself occasionally.

It is also advisable to check the cleanliness of the carburettor periodically. Using the wrench supplied, remove the needle-valve holder from the carburettor body and wash out the interior to remove any minute particles that may have escaped through the filters.

Remove this with an 8mm wrench

DIRT AND FIBROUS MATTER MOSTLY ACCUMULATES HERE

RUNNING-IN ("Breaking-in")

It has been observed that some modellers consider the running-in of an engine to be complete after simply running it on a bench mount for a time. This is incorrect. For the best performance, the engine should also be run in under normal running conditions as when it is put to full use. Run-in your engine after installing it in your boat, in the following way:

1. For the initial stage, set the needle-valve as much on the rich side as possible without badly affecting the running of the engine. Then, with each successive run, gradually and progressively reduce the needle-valve for increased r.p.m. Set the needle-valve on the rich side for at least the first 10 to 15 runs. If it is intended to use high nitromethane fuels, begin by using one in which the nitromethane content is limited to between 10 to 20 percent.

2. When the engine is capable of running at the optimum setting without overheating or loss of power, a fuel of higher nitromethane content may be used. However, each time the nitromethane percentage is increased, always take the precaution of re-setting with a rich needle setting for a further trial run.

WARNING:
When the engine is installed in the model, avoid running it at high r.p.m. without load just after the engine is started on shore, either by closing the throttle or by opening the needle-valve to reduce speed. Although this engine is designed to run at high r.p.m. even when new, such components as the cylinder, piston, connecting-rod, etc. will be seriously damaged if they are allowed to become over-heated. Re-adjust the throttle and/or needle-valve immediately before the model is put in the water.

CARE AND MAINTENANCE

- At the end of each operating session, drain out any fuel that may remain in the fuel tank. Afterwards, energize the glowplug 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. To aid exhaust while the engine is still warm.

- Follow this procedure with the injection of some corrosion-inhibiting oil, rotating the engine by hand to distribute the oil to all working parts. Alternatively, an electric starter may be used if the glowplug is removed. (In this case, hold a clean cloth over the cylinder-head to catch surplus oil that may spray from the glowplug hole.)

Note:
Corrosion-inhibiting oil should be directed into the engine's crankcase, but not into the carburettor itself, as this may cause deterioration of the O-ring seals inside the carburettor mechanism. These procedures will reduce the risks of corrosion or difficult starting after a period of storage.

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

GUARANTEE

This engine is constructed from the very best materials available and to the very highest engineering standards, using the most advanced precision machinery. However, the extremely high stresses imposed by boat racing operation under very severe conditions, stresses which, exacerbated by the use of powerful fuels containing very high concentrations of nitromethane, constitute hazards which are beyond a manufacturer's control. Accordingly, we regret that it is not possible to extend our usual warranty terms to this particular engine-i.e. no guarantee is offered against material wear, or damage resulting therefrom, in actual use.

Needle Control Lever

By fitting the Needle Control Lever (optional extra) to the needle knob, the needle-valve can be adjusted by radio-control. Before fitting the Lever, remove the needle ratchet spring.
9) With the optimum mixture control valve position, light smoke is visible during high-speed running and engine revolutions increase smoothly during acceleration. Remember that, if the engine is operated with the fuel/air mixture slightly too lean, it will overheat and run unevenly or out. As with all engines, it is wise to set both valves a little on the rich side of the best rpm setting, as a safety measure.
10) When the best balance of mixture adjustments has been determined and, especially as the engine becomes fully run-in, it will probably be found that the idling speed has increased. Readjust the throttle opening by means of the trim lever on the transmitter, so that the lowest idling speed, without risk of stalling the engine, may be obtained.

---

**CARBURRETTOR CLEANLINESS**

The correct functioning of the carburettor depends on its small fuel orifices remaining clear. The minute particles of foreign matter that are present in any fuel, can easily partially obstruct these orifices and upset mixture strength so that engine performance becomes erratic and unreliable.

O.S. 'Super-Filters' (large and small) are available, as optional extras, to deal with this problem. One of these filters, fitted to the outlet tube inside your refuelling 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 carburettor.

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

---

**CARE AND MAINTENANCE**

To ensure that you obtain long life and peak performance from your engine, observe the following:

1) As previously observed, foreign matter in the fuel can cause problems. Therefore:
   - Rinse out the fuel tank with methanol or fuel before installing it.
   - Fit a fuel filter to the fuel delivery tube between tank and carburettor.
   - Fit a fuel filter to the outlet of your squeeze bottle, or to the pump inlet if you use a manual or electric pump.
   - Do not leave your fuel container open needlessly.
   - O.S. 'Super-Filters' (large and small) are available, as optional extras, to deal with this problem. One of these filters, fitted to the outlet tube inside your refuelling container, will prevent the entry of foreign material into the fuel tank.
   - Do not forget to clean the filters regularly to remove dirt and lint that accumulate on the filter screens. Also, clean the carburettor itself occasionally.

2) At the end of each operating session, drain out any fuel that may remain in the fuel tank. Afterwards, energise the carburettor 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. Leaving fuel residues within the engine can result in difficult starting after a period of storage. It may also cause corrosion. To reduce such risks, it is helpful to inject some corrosion inhibiting oil into the engine's air intake. Rotate the engine many times to distribute the oil to all the working parts.

---

**ENGINE PARTS LIST**

- **No.**
- **Code No.**
- **Description**
- **21240400**
  - Water Coolled Head Assembly
- **21610500**
  - Cylinder & Piston Assembly
- **21769000**
  - Popa Pin
- **21205040**
  - Connecting Rod
- **21481100**
  - Carbuurettor Complete(1/2)
- **20800077**
  - Propol Nut
- **21468000**
  - One Nut
- **21263120**
  - Crankcase Bearing Remover
- **21801200**
  - Crankcase
- **21467100**
  - Carbuurettor Remover
- **21930000**
  - Crankcase Bearing Remover  
- **21202210**
  - Crankcase  
- **21045000**
  - Gasket Set
- **21214020**
  - Cover Plate
- **21210300**
  - Screw Set
- **21422050**
  - Startng Shaft
- **21210500**
  - Rear Thrust Washer
- **21413200**
  - Rocker Arm
- **21213200**
  - Screw Set
- **21930000**
  - Air/Read Starter Assembly  
- **71605000**
  - Glow Plug K3  
- **21285000**
  - B11 Bancer  
- **21213200**
  - B61 Universal Transaxle  
- **71905020**
  - Flywheel Pin. No.10  
- **21482000**
  - Universal Joint Assembly  
- **71552000**
  - Crankshaft Clamp 1510  
- **71520000**
  - Long Socker Wrench  

---

**CARBURRETTOR PARTS LIST**

- **No.**
- **Code No.**
- **Description**
- **21246162**
  - Mixture Control Screw
- **21246132**
  - Throttle Lever Fixing Nut  
- **21246149**
  - Throttle Lever  
- **212681419**
  - Throttle Lever  
- **21285210**
  - Dula Cover  
- **21461300**
  - Carburettor Note  
- **21461990**
  - Rotor Spring  
- **21461300**
  - Needle Valve Assembly  
- **21801300**
  - "O" Ring (x2)  
- **21283962**
  - Nozzle Assembly  
- **24081204**
  - "O" Ring (x2)  
- **21283961**
  - Nozzle  

---

**TROUBLE SHOOTING WHEN THE ENGINE FAILS TO START**

Four key points for quick, reliable starting, the following four conditions are required:

1) Good compression:
   - Adequate "glow" at glowplug.
   - Correct mixture.
   - Sufficient electric starter rotating speed.

If the engine fails to start, or does not keep running after being started, check symptoms against the following chart and take necessary corrective action. The most common causes of trouble are marked with three asterisks, the less common problems with one or two asterisks.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Factor</th>
<th>Cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine fails to start.</td>
<td>-2</td>
<td><strong>Glowplug</strong> battery discharged.</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>-3</td>
<td><strong>Glowplug</strong> element damaged.</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td>-4</td>
<td><strong>Glowplug</strong> heating using with battery leads.</td>
<td>-4</td>
</tr>
<tr>
<td></td>
<td>-5</td>
<td>**Engine&quot; Oiled&quot;.</td>
<td>-5</td>
</tr>
<tr>
<td></td>
<td>-6</td>
<td><strong>Insufficient fuel.</strong></td>
<td>-6</td>
</tr>
<tr>
<td></td>
<td>-7</td>
<td><strong>Insufficient cooling</strong></td>
<td>-7</td>
</tr>
<tr>
<td></td>
<td>-8</td>
<td><strong>Excess fuel</strong></td>
<td>-8</td>
</tr>
<tr>
<td></td>
<td>-9</td>
<td><strong>Glowplug removed</strong></td>
<td>-9</td>
</tr>
<tr>
<td></td>
<td>-10</td>
<td><strong>Insufficient fuel.</strong></td>
<td>-10</td>
</tr>
<tr>
<td></td>
<td>-11</td>
<td><strong>Mixture too rich.</strong></td>
<td>-11</td>
</tr>
<tr>
<td></td>
<td>-12</td>
<td><strong>Fuel not reaching tank.</strong></td>
<td>-12</td>
</tr>
<tr>
<td></td>
<td>-13</td>
<td><strong>Mixture too rich.</strong></td>
<td>-13</td>
</tr>
<tr>
<td></td>
<td>-14</td>
<td><strong>Mixture of glow plug.</strong></td>
<td>-14</td>
</tr>
</tbody>
</table>

---

© Copyright 1998 by O.S. Engines Mfg. Co., Ltd. All rights reserved. Printed in Japan.