
O.S. ENGINE

ROTARY ENGINE 49PI

OWNER'S INSTRUCTION MANUAL

It is of vital importance, before attempting to operate your engine, to read the general **'SAFETY INSTRUCTIONS AND WARNINGS'** section on pages 2-6 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 aircraft, radio control equipment, etc., are accessible for checking at the same time.



Due to updating and improvement, latest products may occasionally differ from those shown in the photos.

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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 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

- Never touch, or allow any object to come into contact with, the rotating propeller and do not crouch over the engine when it is running.



- A weakened or loose propeller may disintegrate or be thrown off and, since propeller tip speeds with powerful engines may exceed 600 feet(180 metres) per second, it will be understood that such a failure could result in serious injury, (see 'NOTES' section relating to propeller safety).

- 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.



- 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 was designed for model aircraft. 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 lock-nuts.
- Be sure to use the silencer (muffler) supplied with the engine. Frequent exposure to an open exhaust may eventually impair your hearing. Such noise is also likely to cause annoyance to others over a wide area.
- If you remove the glowplug from the engine and check its condition by connecting the battery leads to it, do not hold the plug with bare fingers. Use an appropriate tool or a folded piece of cloth.
- Install a top-quality propeller of the diameter and pitch specified for the engine and aircraft. Locate the propeller on the shaft so that the curved face of the blades faces forward-i.e. in the direction of flight. Firmly tighten the propeller nut, using the correct size wrench.



NOTES

- Always check the tightness of the propeller nut and retighten it, if necessary, before restarting the engine, particularly in the case of four-stroke-cycle engines. If a safety locknut assembly is provided with your engine, always use it. This will prevent the propeller from flying off in the event of a "backfire", even if it loosens.
- If you fit a spinner, make sure that it is a precision made product and that the slots for the propeller blades do not cut into the blade roots and weaken them.
- Preferably, use an electric starter. The wearing of safety glasses is also strongly recommended.
- Discard any propeller which has become split, cracked, nicked or otherwise rendered unsafe. Never attempt to repair such a propeller: destroy it. Do not modify a propeller in any way, unless you are highly experienced in tuning propellers for specialized competition work such as pylon-racing.
- Take care that the glow plug clip or battery leads do not come into contact with the propeller. Also check the linkage to the throttle arm. A disconnected linkage could also foul the propeller.
- After starting the engine, carry out any needle-valve readjustments from a safe position behind the rotating propeller. Stop the engine before attempting to make other adjustments to the carburetor.



NOTES

- 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.
- Take care that loose clothing (ties, shirt sleeves, scarves, etc.) do not come into contact with the propeller. Do not carry loose objects (such as pencils, screwdrivers, etc.) in a shirt pocket from where they could fall through the propeller arc.
- Do not start your engine in an area containing loose gravel or sand. The propeller may throw such material in your face and eyes and cause injury.
- For their safety, keep all onlookers (especially small children) well back (at least 20 feet or 6 meters) when preparing your model for flight. If you have to carry the model to the take-off point with the engine running, be especially cautious. Keep the propeller pointed away from you and walk well clear of spectators.
- 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 propeller is casually flipped over compression WITHOUT the glowplug battery being reconnected. Remember this if you wish to avoid the risk of a painfully rapped knuckle!

THE NSU/WANKEL SYSTEM

Now available in a new and improved PI(peripheral inlet) model, its outstanding features remain its high specific power output, its almost total freedom from vibration, its relatively low noise level and its compact shape.

This highly successful application of the NSU/Wankel System to a power unit of miniature proportions, was only made possible by the expertise of O.S. research and development engineers and by the high levels of precision craftsmanship achieved in its tooling and manufacture.

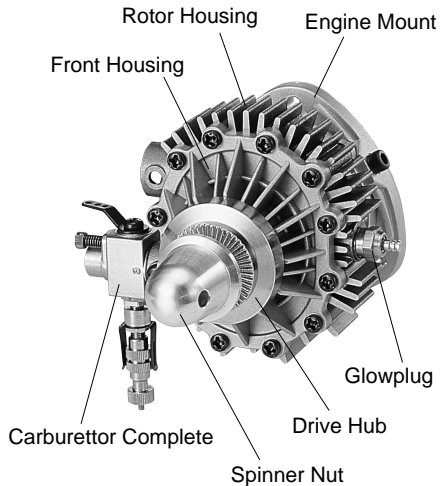
OPERATING PRINCIPLE

In place of the piston and cylinder of a conventional reciprocating engine, the Wankel motor has a three-lobe rotor which moves in a circular path, while rotating about its own axis,

within a housing having an epitrochoidal bore - i.e. a wide-waisted figure-of-eight shape. Planetary rotation is controlled by an eccentric shaft, an internally-toothed gear and a fixed pinion mounted centrally on the rear cover plate. The tips of the rotor are in continuous contact with the housing, forming three chambers, each of which changes in volume, with rotation, to effect suction, compression, expansion and exhaust phases, as in a four-stroke reciprocating engine. Spring-loaded tip seals on the rotor prevent gases from passing from one chamber to the adjoining one and the rotor uncovers ports, as in a two-stroke engine, to control intake and exhaust timing.

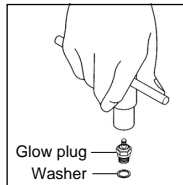
The engine is fitted with a conventional throttle type carburettor that gives smooth and progressive control of engine speed from idling to full power. It is also supplied with a compact matched muffler that very effectively attenuates exhaust noise without causing undue power loss.

BASIC ENGINE PARTS



Installing the glowplug

Carefully insert plug, with washer, fingertight only, before final tightening with the correct size plug wrench.



GLOWPLUG

A specially designed O.S. Type RE glowplug is fitted to this engine. Carefully fit 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. However, plug life can be extended and engine performance maintained by careful use, i.e.:

- Install a plug suitable for the engine.
(i.e. O.S. Type RE)
- 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.

MOUNTING THE ENGINE

Firmly bolt the engine's radial mounting flange to the model or to a rigid test stand, using self-locking nuts or secondary nuts locked to the first.

Make sure that the three cap screws securing the mounting flange to the engine itself, are tight and are fitted with spring washers.

The engine is normally mounted so that the carburettor is horizontal on the right side and the glowplug on the left (i.e. when viewed from astern).

The engine should receive a free flow of cooling air. Do not obstruct airflow with an oversized spinner.

If the engine is cowled, make sure that the air entering at the front is able to escape easily: the outlet area for the cooling air should not be less than the entry area and should preferably be larger.

Position the fuel tank so that when full, the fuel level is approximately in line with the fuel jet. Keep the fuel line short, i.e. install the tank as close as possible to the back of the motor.

BEFORE STARTING

Tools, accessories, etc.

The following items are necessary for operating the engine.

FUEL

For this engine, use top quality methanol-based model engine fuel containing approximately 25% castor-oil and between 5% and 15% nitromethane.

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 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.

PROPELLER

The suitability of the prop depends on the size and weight of the model and type of flying. Determine the best size and type after the engine has been run in. Check the balance of the propeller before fitting it to the engine. Unbalanced propellers cause vibration and loss of power. Wooden propellers are to be preferred. Some nylon propellers are not strong enough to withstand the high power output of these engines and a thrown blade can be very dangerous. As a starting point, we recommend 9x5~6, 9.5x5 and 10x5 for general use.

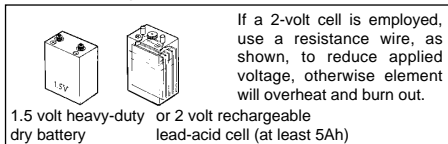
REMINDER!



Never touch, or allow any object to come into contact with, the rotating propeller and do not crouch over the engine when it is running.

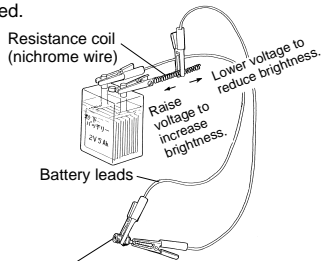
Glowplug battery

The power source for heating the glowplug may be either a large heavy-duty 1.5volt dry cell, or preferably, a 2-volt rechargeable lead-acid cell (accumulator).



Warning (Very hot)

Never touch the nichrome wire while the battery is connected.



Adjust applied voltage by changing the position of clip on resistance coil until glowplug element is glowing bright red.

Battery leads

These are used to conduct current from the battery to the glowplug. Basically, two leads, with clips, are required, but, for greater convenience, twin leads with special glowplug connectors, as shown on the right, are commercially available.

Battery leads



Fuel tank

For installation in the model, is 240cc(8.5oz.) tank, is suggested.

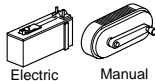
Fuel bottle or pump

For filling the fuel tank, a simple, polyethylene "squeeze" bottle, with a suitable spout, is all that is required. Alternatively, one of the purpose-made manual or electric fuel pumps may be used to transfer fuel directly from your fuel container to the fuel tank.



Fuel bulb

Fuel pumps

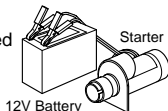


Electric

Manual

Electric starter and starter battery

An electric starter is recommended for starting.



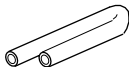
Fuel can filter

Fit a filter to the outlet tube of your refuelling container to prevent entry of foreign matter into the fuel tank.

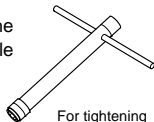
Fuel Can Filter

**Silicone tubing**

This is required for the connection between the fuel tank and engine.

**Plug wrench**

Used for tightening glowplug. The O.S. long plug wrench is available as an optional accessory.

For tightening
glowplug

STARTING

Fill the fuel tank and open the needle-valve 2-3 turns from the closed position.

Prime the engine fairly liberally with fuel through the carburettor. Turn the propeller through one complete revolution and prime again. Repeat this procedure once more so that all three chambers, formed between the rotor flanks and housing, are primed. Now rotate the prop through several revolutions so that any excess of fuel is blown through the exhaust port. This will leave the chambers with just about the correct proportion of fuel and air for starting.

An alternative priming procedure, that some users may find preferable when an electric starter is being used, is to simply finger-choke the intake (throttle fully open) while turning the prop for six revolutions.

Now close the throttle to between one-quarter and one-third open, connect glowplug lead and apply electric starter.

After starting, allow the engine to warm up for 5~6 seconds, then remove the plug lead, open the throttle fully and adjust the needle-valve. Adjust for rich, reduced-rpm running when the engine is new (see paragraph below on "Running-in") : otherwise adjust for full power.

When re-starting the engine hot, do not prime: simply close the throttle and apply the starter: it will burst into life again immediately.

RUNNING-IN ("Breaking-in")

For running-in, fit the engine with a well-balanced propeller intended for actual flight. Use a fuel mixture as specified. Running-in procedure is the same as for a conventional reciprocating model engine. After starting the motor, open the throttle fully, but use a rich needle-valve setting to reduce rpm, increase lubrication and lower running temperature. This will produce a smoky exhaust but will ensure that the engine does not become overheated and damaged during this critical period.

The break-in should be split up into periods of not more than 5 minutes, allowing the engine to cool between spells of running. After about 30 minutes' running time have been accumulated, the needle valve may be gradually closed on each successive run until continuous full-power is being delivered. This is with the needle-valve set slightly rich of the setting at which maximum speed is reached. If the engine shows signs of slowing-up and overheating, immediately reopen the needle-valve and continue the running-in process.

PRE-FLIGHT CHECKING

Prior to releasing your model for take-off, carefully check that the engine continues to run steadily in all flight attitudes: this includes holding the model with the nose pointing vertically upwards. In that attitude (assuming the model to be equipped with a stunt type fuel-tank) the engine must not quit: if it does, the mixture is set too lean. Open the needle-valve until the engine runs safely in this attitude. Adjust the carburettor (needle-valve and throttle stop) carefully and make sure that the R/C servo linkage moves fully and freely between the idle and full-throttle positions.

SUBSEQUENT READJUSTMENT

Once the engine has been run-in and the controls properly set up, it should be unnecessary to alter the mixture settings; except to make minor adjustments to the Needle-Valve occasionally, to take account of variations in climatic conditions.

The use of a different fuel, however, particularly one containing more, or less, nitromethane and/or a different type or proportion of lubricating oil, is likely to call for some readjustment of the Needle-Valve.

Remember that, as a safety measure, it is advisable to increase the Needle-Valve opening by an extra half-turn counter-clockwise, prior to establishing a new setting. The same applies if the silencer type is changed. A different silencer may alter the exhaust pressure applied to the fuel feed and call for a revised Needle-Valve setting. The use of a different glowplug may also require compensating carburettor readjustments.

ENGINE CARE AND MAINTENANCE

1. At the end of each operating session, drain out any fuel that may remain in the fuel tank.
2. Next, 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. Remove the glowplug and eject any residue by rotating the engine with an electric starter for 4 to 5 seconds while the engine is still warm.
3. Finally, inject some after-run oil into the engine. Rotate the engine a few times by hand, to make sure that it is free, and then with an electric 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-ring inside the carburetor to deteriorate.

These procedures will reduce the risk of starting difficulties and of internal corrosion after a period of storage.

O.S. GENUINE PARTS & ACCESSORIES

- **EXHAUST PIPE ASSEMBLY**
(41651010)

- **SPINNER NUT**
1/4"-28(L)
(23024009)



- **LONG PROPELLER NUT SETS**
(73101000)



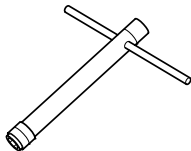
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- **SUPER FILTER**
(72403050)



- **NON-BUBBLE WEIGHT**
(71531000)



- **LONG SOCKET WRENCH WITH PLUG GRIP**
(71521000)

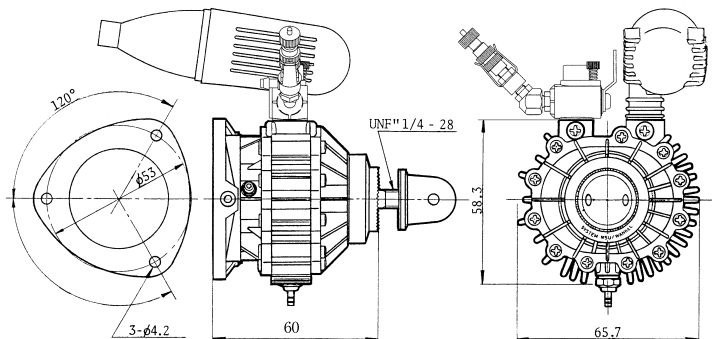


THREE VIEW DRAWING

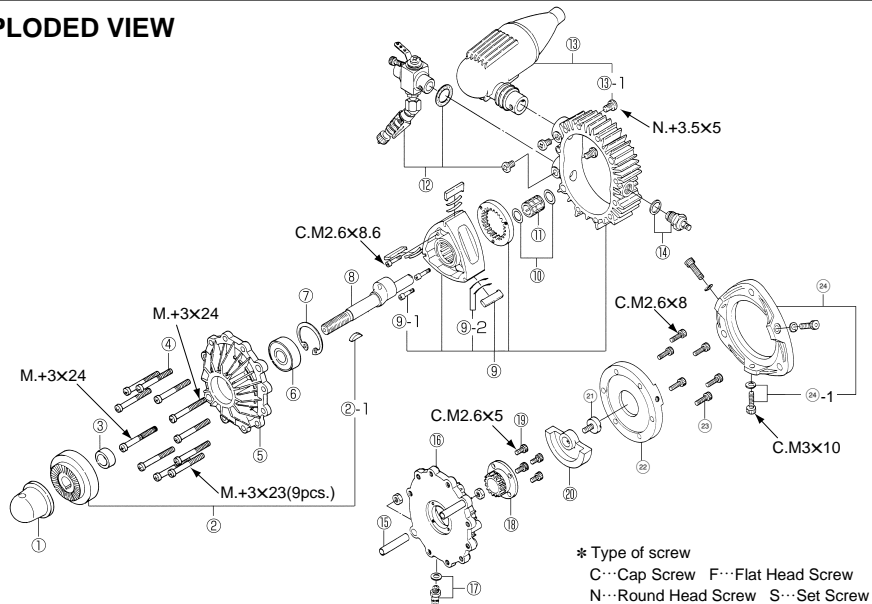
Dimensions(mm)

SPECIFICATIONS

■ Displacement	4.97 cc (0.303cu.in.)
■ Bore	_____
■ Stroke	_____
■ Practical R.P.M.	2,500~18,000 r.p.m.
■ Power output	1.27bhp / 17,000 r.p.m.
■ Weight	335g (11.8oz.)



EXPLODED VIEW



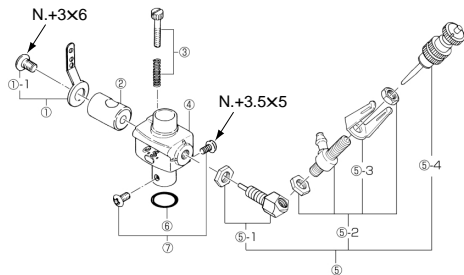
ENGINEN PARTS LIST

No.	Code No.	Description
①	23024008	Spinner Nut
②	41612000	Drive Hub
②-1	41826005	Woodruff Key
③	41625000	Shaft Spacer
④	41822000	Housing Assembly Screw Set
⑤	41601000	Front Housing
⑥	41614000	Crankshaft Ball Bearing(F)
⑦	41614100	Front Bearing Retainer
⑧	41604000	Eccentric Shaft
⑨	41602010	Rotor Housing Assembly
⑨-1	41820001	Rotor Gear Retaining Screw
⑨-2	41807004	Seal Spring(6pcs.)
⑩	41827002	Thrust Washer (2pcs.)
⑪	41815009	Rear Bearing
⑫	41618020	Carburettor Type 49PI-RN

No.	Code No.	Description
⑬	41635010	Silencer 49-PI Assembly
⑬-1	23081706	Silence Retaining Screw
⑭	71614001	Glow Plug Type RE
⑮	41830000	Housing Assembly Tubular Dowels(2pcs.)
⑯	41603000	Rear Housing
⑰	22681953	Nipple No.1
⑱	41609000	Fixed Gear
⑲	41621000	Fixed Gear Retaining Screw(4pcs.)
⑳	41611000	Rear Counter Weight
㉑	45067319	Rear Counter Weight Retaining Screw
㉒	41616000	Rear Cover
㉓	41624000	Rear Cover Retaining Screw(6pcs.)
㉔	41633000	Engine Mount
㉔-1	41634000	Engine Retaining Screw(3pcs.)

Specifications are subject to alteration for improvement without notice.

CARBURETOR EXPLODED VIEW & PARTS LIST



* Type of screw

C...Cap Screw F...Flat Head Screw

N...Round Head Screw S...Set Screw

No.	Code No.	Description
①	41618400	Throttle Lever
①-1	22081313	Throttle Lever Retaining Screw
②	22081200	Carburettor Rotor
③	22081811	Throttle Stop Screw
④	41618110	Carburettor Body
⑤	41618900	Needle Valve Assembly
⑤-1	41618910	Nozzle Assembly
⑤-2	41618920	Needle Valve Holder Assembly
⑤-3	23011308	Ratchet Spring
⑤-4	22281977	Needle
⑥	41818056	Carburettor Rubber Gasket
⑦	23081706	Carburettor Retaining Screw

Specifications are subject to alteration for improvement without notice.



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