

It is of vital importance, before attempting to operate your engine, to read the general 'SAFETY INSTRUCTIONS AND WARNINGS' in the following section 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.

### 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.



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.



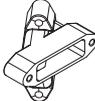
Model engine fuel is also highly flammable. Keep it away from open flame, excessive heat, sources of sparks, or anything else which might ignite it. Do not smoke or allow anyone else to smoke, near to it.

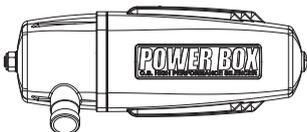
### ■ ABOUT THE ENGINE

Two versions are available, the one is without silencer, extension adaptor and 90 degree adaptor and the other is with all of them.

- This is a high performance two stroke engine designed for sport and scale models.
- Crankcase and cylinder head are of aero-shape design which give advantage of light weight, compact size.
- The new 70D carburetor needlevalve assembly has now been angled backward for safety.
- New E-5020 silencer (POWER BOX) develops very effective muffling. Also, the compact body enables it to be fit with in most cowls.
- Extension adaptor and 90 degree adaptor offer various silencer installations.

### STANDARD ACCESSORIES

- Glow Plug No.8 
- Needle Valve Extension Cable Set 
- E-5020 Silencer Extension Adapter
  - Silencer Extension Adapter
  - Retaining Screw (M4x90 2pcs.)
- E-5020 Silencer 90° Adapter
  - Silencer 90° Adapter Retaining Screw (M4x20 2pcs.)
- E-5020 Silencer Assembly
  - Silencer Retaining Screw (M4x45 2pcs.)



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.



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).

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.

### ⚠ 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 locknuts.
- 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.
- Always check the tightness of the propeller nut and retighten it, if necessary, before restarting the engine. Also, check the tightness of all the screws and nuts before restarting the engine.
- If you install 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.

### ■ BEFORE STARTING

#### ● PROPELLERS

The choice of propeller depends on the design and weight of the aircraft and the type of flying in which you will be engaged. Determine the best size and type after practical experimentation. As a starting point, refer to the props listed in the accompanying table. Slightly larger, or even slightly smaller, props than those shown in the table may be used, but remember that the propeller noise will increase, due to higher rpm or if a larger-diameter / lower-pitched prop is used.

SIZE(DxP)	15x10-12, 16x8-10
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#### Warning:

Make sure that the propeller is well balanced. An unbalanced propeller and/or spinner can cause serious vibration which may weaken parts of the airframe or affect the safety of the radio-controlled system.

#### ● SPINNER

Since the engine is intended to be started with an electric starter, the addition of a spinner assembly for centering the starter sleeve is desirable. Use a heavy-duty, well balanced spinner either of metal or plastic.

#### ● FUEL

The 120AX should be operated on a methanol based fuel containing not less than 18% (volumetric) castor oil, or a top quality synthetic lubricant (or a mixture of both), plus a small percentage (5-20%) of nitromethane for improved flexibility and power. (The carburetor is adjusted a little on the rich side at the factory for a fuel containing 20% lubricant and 15% nitromethane.) Some commercial fuels also contain coloring additives as an aid to fuel level visibility. In some cases, these additives have indicated slightly negative effects on the performance. We would suggest that you use such fuels only if you are satisfied that they do not adversely affect running qualities when compared with familiar standard fuels.

- 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.
- 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!

When changing to a fuel brand or formula that is different from the one to which you are accustomed, it is a wise precaution to temporarily revert to in-flight running-in procedures, until you are sure that the engine is running entirely satisfactorily.

#### ● Fuel Tank

A fuel tank of approximately 350cc capacity is suggested. This allows around 10-12 minutes flying time, dependent upon the type of fuel used, the size of propeller and on the amount of full-throttle to part-throttle operation throughout the flight.

#### ● Electric Starter and Starter Battery

Required when starting the engine.

#### ● Fuel Pump

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.

#### ● GlowPlug Igniter

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

#### ● O.S. Super Filter (Fuel Can Filter)

Install a filter on the outlet tube of your refueling container to prevent entry of foreign matter into fuel tank. O.S. 'Super Filters' (large and small) are available as optional extras.

#### ● O.S. Non-Bubble Weight

To prevent the pickup from adhering to the tank wall under suction and restricting fuel flow, slots may be filed I the end of the weight. Alternatively, O.S. Non-Bubble Weight is available as an optional extra.

#### ● Fuel Filter

It is recommended to install a good in-line filter between the fuel tank and carburetor to prevent entry of foreign matter into the carburetor.

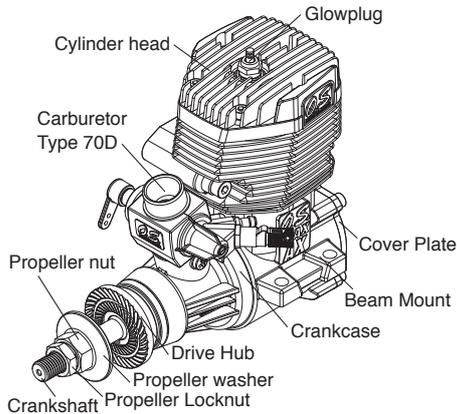
● **O.S. SPEED Silicone Fuel Line** (optional extra)

The connection between the fuel tank and the engine.  
ID. 2.5mm Length 1000mm

● **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.

■ **BASIC ENGINE PARTS**



■ **INSTALLATION**

It is suggested to use as heavy and rigid as possible engine mounting for highest performance and safe running. Install the engine on a plastic mount using at least 4mm steel screws, such as Allen type, with locknuts, for bolting the engine to the bearers.

● Make sure that these mounting beams are accurately aligned and firmly integrated with the airframe, reinforcing the adjacent structure to absorb vibration. Use 4mm or larger steel screws, preferably Allen type hexagon socket head cap screws, with washers and locknuts, for bolting the engine to the bearers.

● **O.S. Radial Motor Mount**

A special O.S. radial motor mount (Code No.71904200) is available, as an optional extra, for use where firewall type mounting is required.

■ **THROTTLE LINKAGE**

Before connecting the throttle to its servo, make sure that the throttle arm and linkage safely clear any adjacent part of the airframe structure, etc., as the throttle is opened and closed. Connect the linkage so that the throttle is fully closed when the transmitter throttle stick and its trim lever are at their lowest settings and fully open when the throttle stick is in its fully-open position. Carefully align the appropriate holes in the throttle arm and servo horn so that they move symmetrically and smoothly through their full travel.

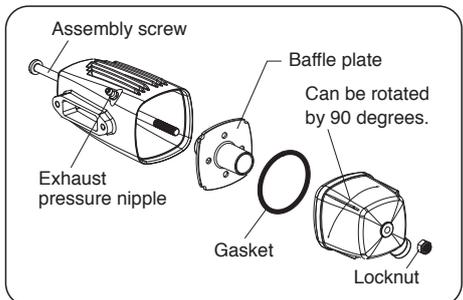
■ **INSTALLATION OF SILENCER AND ADAPTORS**

Secure the silencer to the engine by means of two retaining screws supplied after the engine is securely mounted to a test bench or a model.

The exhaust outlet of the silencer can be rotated by 90 degrees the following manner:

- 1) Loosen the locknut and assembly screw.
- 2) Set the exhaust outlet at the required position by rotating the rear part of the silencer.
- 3) Re-tighten the assembly screw, followed by the locknut.

It is recommended to seal the fitting faces of engine exhaust and silencer with silicone sealant.



■ **In case of installing the silencer direct to the engine**

After the engine is securely mounted to a model or a test bench, secure the silencer to the engine by means of two retaining screws (M4x45) supplied.

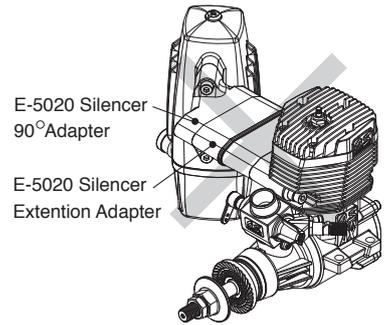
■ **In case of installing the silencer with the extension adaptor to the engine**

Secure the silencer and the extension adaptor to the engine by means of two retaining screws (M4x90) supplied.

■ **In case of installing the silencer with the 90 degree adaptor to the engine**

First secure the silencer to the 90 degree adaptor by means of two retaining screws (M4x20). Then, secure the assembly to the engine by means of two retaining screws (M4x45).

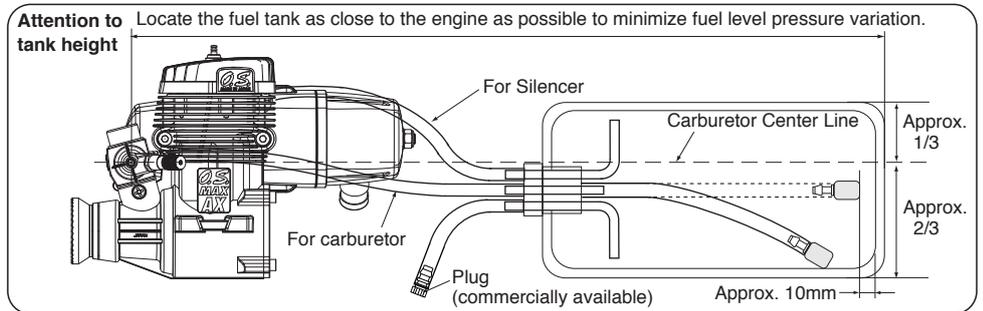
**Note:**  
Do not use the extension adaptor and the 90 degree adaptor at the same time (simultaneously), or they may break.



■ **FUEL TANK LOCATION**

- Make sure that the tank is well rinsed out with methanol or glow fuel before installation and that the pickup weight is well clear of the bottom of the tank when held vertically.
- The Fuel line pickup weight should be 10mm away from the back of the tank.

- Position the fuel tank so that approximately 1/3 of the tank height is above the center line of the needlevalve.
- Be sure to use a pressurized fuel system by connecting the muffler pressure nipple to the vent-pipe of the fuel tank.



■ **MIXTURE CONTROLS**

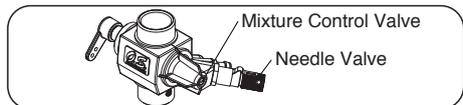
Two mixture controls are provided on this Carburetor.

● **The Needle Valve**

When set to produce maximum power at full throttle, this establishes the basic fuel/air mixture strength. The correct mixture is then maintained by the carburetor's built-in automatic mixture control system to cover the engine's requirements at reduced throttle settings.

● **The Mixture Control Valve**

This meters fuel flow at part-throttle and idling speeds to ensure reliable operation as the throttle is opened and closed. The Mixture Control Valve is factory set for the approximate best result. First run the engine as received and readjust the Mixture Control Screw only if necessary.



7. Bring electric starter into contact with spinner-nut or spinner and depress starter switch for one or two seconds. Repeat if necessary. When the engine starts, withdraw the starter immediately.

**Attention :**

Do not choke the carburetor air intake when applying the starter. This could cause an excessive amount of fuel to be drawn into the cylinder which may initiate a hydraulic lock and damage the engine.

**VERY IMPORTANT!**

Before being operated at full power (i.e. at full-throttle and with the needle-valve closed to its optimum setting) the engine must be adequately run-in, otherwise there is a danger of it becoming overheated and damaged.

**How to stop the engine**

Pull down the throttle lever and trim lever on the transmitter fully.

**Note:**

Make sure that the throttle linkage is set so that the throttle is fully closed when the throttle lever as well as trim lever on the transmitter are fully pulled down.

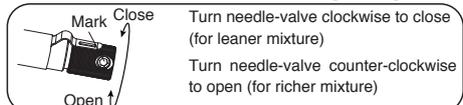
■ **RUNNING-IN ("Breaking-in")**

All internal-combustion engines benefit from extra care when they are run for the first few times known as running-in or breaking-in. This allows the working parts to mate together under load at operating temperature. Therefore, it is vitally important to complete the break-in before allowing the engine to run continuously at high speed and before finalizing carburetor adjustments. However, because O.S. engines are produced with the aid of the finest modern precision machinery and from the best and most suitable materials, only a short and simple running-in procedure is called for and can be carried out with the engine installed in the model. The process is as follows.

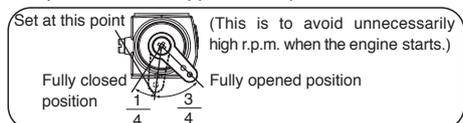
■ **STARTING**

Be sure to use an electric starter to start the engine. Starting procedure is as follows:

1. Fill the fuel tank with fuel. When filled, prevent fuel flowing into the carburetor with a commercially available fuel stopper, etc. Release the stopper before starting the engine.
2. Make sure that plug element glows red, and install the plug in the cylinder head.
3. Check that the needle-valve is closed. (Do not overtighten.) Now open the needle-valve counter-clockwise 2.5 to 3 turns to the starting setting.



4. Open the throttle approx. one-quarter.



5. Apply the starter and press the starter switch for 5-6 seconds to prime the engine.
6. Connect battery leads to glowplug.

1. Install the engine with the propeller intended for your model. Open the needle-valve to the advised starting setting and start the engine. If the engine stops when the glow plug battery is disconnected, open the needle-valve to the point where the engine does not stop. Run the engine for one minute with the throttle fully open, but with the needle-valve adjusted for rich, slow "four-cycle" operation.



Then, immerse the engine in a container of alcohol. Rotate the crankshaft while the engine is immersed. If foreign matter is visible in the alcohol, rinse the engine again in clean alcohol. Finally, shake off and dry the alcohol, and inject some after-run oil in the glowplug hole and rotate the crankshaft several times by hand. Reinstall the carburetor and glowplug on the engine and keep it in a dry place after putting in a vinyl bag.

■ O.S. GENUINE PARTS & ACCESSORIES

● O.S.GLOW PLUG

No.7 (71607100)

No.8 (71608001)

No.10 (Fomer A5) (71605100)

● RADIAL MOTOR MOUNT

(71904200)

● PROPELLER LOCKNUT SET FOR SPINNER

5/16"-M4 (45910200) 5/16"-M5 (45910300)

● SUPER FILTER

(L) (72403050)

● NON-BUBBLE WEIGHT

(71531000)

● NON-BUBBLE WEIGHT (S)

(71531010)

● BLIND NUTS (10pcs./sets)

M4 (79870040) M5 (79870050)

● LOCK WASHER (10sets)

M4 (55500003) M5 (55500004)

● O.S. SPEED SILICONE FUEL LINE

(72506100)

● O.S. SPEED PLUG WRENCH

(71520100)

● LONG SOCKET WRENCH WITH PLUG GRIP

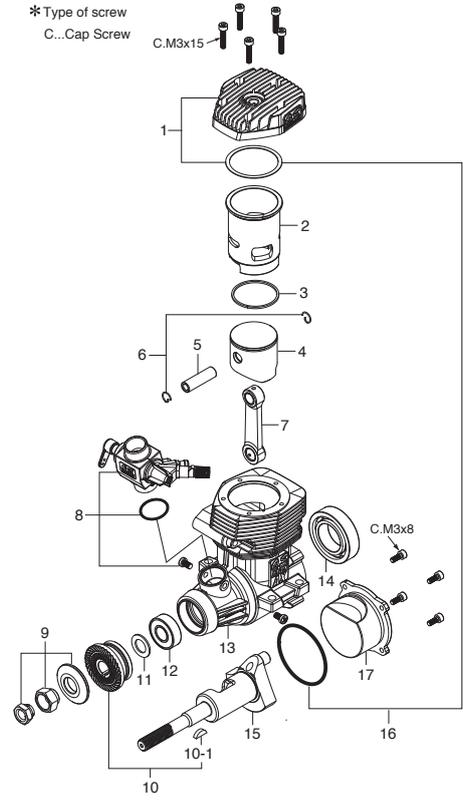
(71521000)

■ THREE VIEW DRAWING Dimensions(mm)

SPECIFICATIONS

■ Displacement	19.96 cc / 1.218 cu.in.
■ Bore	30.4 mm / 1.197 in.
■ Stroke	27.5 mm / 1.083 in.
■ Output	3.1 ps / 3.06 hp / 9.000 r.p.m.
■ Practical R.P.M.	1,800-9,500 r.p.m.
■ Weight	647 g / 22.82 oz. (Engine) 176 g / 6.21 oz. (Silencer) 219.2 g / 7.73 oz. (When 90° adaptor is installed) 245 g / 8.64 oz. (When Extention adaptor is installed)

■ ENGINE EXPLODED VIEW & PARTS LIST

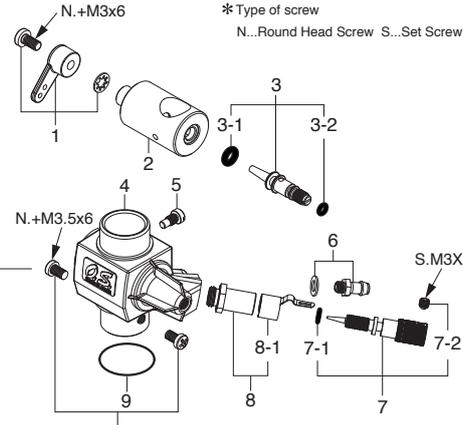


No.	Code No.	Description
1	29124000	Cylinder Head
2	29123100	Cylinder Liner
3	29123400	Piston Ring
4	29123200	Piston
5	29206000	Piston Pin
6	28117000	Piston Pin Retainer (2pcs.)
7	29125000	Connecting Rod
8	29182000	Carburetor Complete (Type 70D)
9	45910100	Locknut Set
10	29128000	Drive Hub
10-1	29008219	Woodruff Key
11	46120000	Thrust Washer
12	26731010	Crankshaft Ball Bearing (F)
13	29121000	Crankcase
14	46030008	Crankshaft Ball Bearing (R)
15	29122000	Crankshaft
16	29121400	Gasket Set
17	29127000	Cover Plate
	71608001	Glow Plug No.8
	72200080	Needle Valve Extension Cable Set
	29122500	E-5020 Silencer Assembly
	29122540	Gasket
	29122530	Assembly Screw
	22681957	Pressure Nipple (No.7)
	29122520	Silencer Retaining Screw (C.M4x45 2pcs.)
	29122600	E-5020 Silencer Extension Adapter
	29122610	Extention Adapter Retaining Screw (M4x90 2pcs.)
	29122700	E-5020 Silencer 90° Adapter
	29122510	90° Adapter Retaining Screw (M4x20 2pcs.)

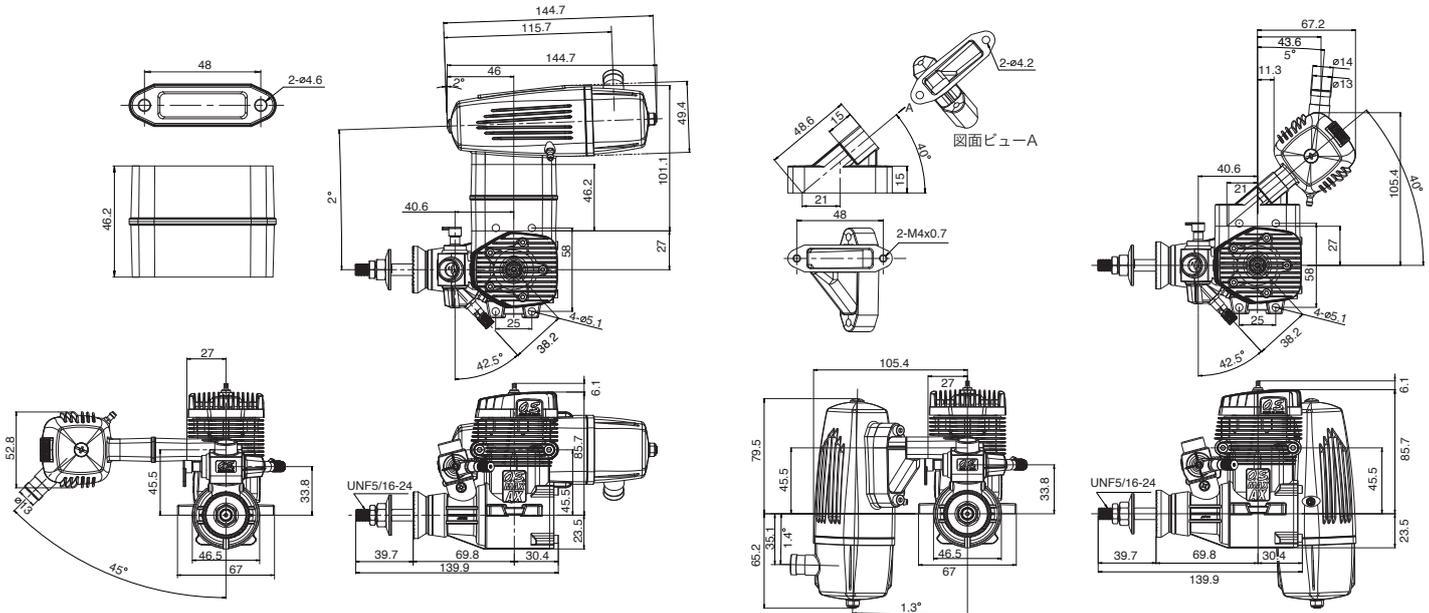
CAP SCREW SETS (10pcs./sets)

Code No.	Size	Pcs. used in an engine
79871110	M3x8	Cover Plate Retaining Screw (4pcs.)
79871150	M3x15	Cylinder Head Retaining Screw (5pcs.)

■ CARBURETOR EXPLODED VIEW & PARTS LIST



No.	Code No.	Description
1	27881400	Throttle Lever Assembly
2	29182200	Carburetor Rotor
3	29181620	Mixture Control Valve Assembly
3-1	46066319	"O" Ring (L) (2pcs.)
3-2	22781800	"O" Ring (S) (2pcs.)
4	29182100	Carburetor Body
5	45581820	Roter Guide Screw
6	22681953	Fuel Inlet (No.1)
7	22681980	Needle-valve Assembly
7-1	24981837	"O" Ring (2pcs.)
7-2	26381501	Set Screw
8	27381940	Needle-valve Holder Assembly
8-1	26711305	Ratchet Spring
9	29015019	Carburetor Rubber Gasket
10	25081700	Carburetor Retaining Screw



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