

SAITO

Small-Medium Single Cylinder 4-Stroke Engine

INSTRUCTION MANUAL

Version 2005



- FA-30S (H)
- FA-30S Golden Knight
- FA-40a
- FA-40a Golden Knight
- FA-50
- FA-50 Golden Knight
- FA-56
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- FA-65
- FA-65 Golden Knight
- FA-72
- FA-72 Golden Knight
- FA-80
- FA-80 Golden Knight
- FA-82a
- FA-82a Golden Knight

- FA-91 Special
- FA-91S Golden Knight
- FA-100
- FA-100 Golden Knight
- FA-125a
- FA-125a Golden Knight

**VERY
IMPORTANT**

*Failure to read
and follow these
instructions before
you proceed to
start your engine
may result in
engine damage
and the voiding of
your warranty.*

Introduction

Congratulations on purchasing a Saito 4-cycle engine. When cared for properly, these high-quality, finely crafted engines offer many years of modeling enjoyment.

This instruction manual has been developed to ensure optimum performance from the Saito engine you have purchased. The instructions must be read through completely and understood thoroughly prior to mounting and running the engine.

Safety Instructions

This model engine will give you considerable pleasure, satisfaction, and performance if you strictly follow these safety instructions and take heed of the warnings as to its safe and proper use. Remember at all times **it is not a toy**, but a precision-built machine with more than enough power to cause harm if misused or if the safety precautions are not observed.

You should always:

1. Mount the engine securely in a "bench mount" or high-quality motor mount. Never clamp the engine in a vice.
2. When running the engine, be sure all spectators, especially children, are at least 20 feet away.

3. Use the correct size and pitch of propeller for your engine, refer to the "Propeller Chart" on page 16 of this manual.
4. It is extremely important to balance the propeller prior to installation of the engine. Failure to do so may cause damage to the Saito engine and/or the airframe. Install the propeller with the convex (curved) side facing forward. Securely tighten the propeller out against the washer and propeller. An anti-loosening nut (or "jarn" nut) is suggested for all 4-cycle engines.
5. Inspect the lightness of the propeller nut prior to each flight.
6. Keep your face and body away from the path of the propeller blades when starting or running your engine.
7. Never allow your hands to come close to the propeller. Utilize either a "Start Stick" or electric starter to start the engine.
8. Discard any propeller that is nicked, scratched, cracked or damaged in any way.
9. Make all carburetor adjustments from behind the propeller.
10. To stop the engine, cut off the fuel supply (pinch or disconnect the fuel line to the carburetor) or use the throttle linkage to shut off the air.

Do not use hands, fingers, or any other part of the body to stop the propeller.

Do not throw any object into a propeller to stop it.

It is highly recommended that:

- Safety glasses or goggles be used when starting and running your engine.
- You do not run the engine in the vicinity of loose gravel or sand. The propeller may throw such materials into your face and eyes. The engine may also ingest these harmful materials.
- Loose clothing should be avoided when operating your model engine. Loose clothing may become entangled in the propeller, creating the possibility of bodily harm. Also, all loose objects (screwdrivers, pencils, nickel cadmium starters, etc.) should be removed from your pockets so that they do not fall into the propeller.
- Glow plug clips and cords are kept away from the propeller.
- Your glow fuel is kept in a safe place well away from sparks, heat, or anything that can ignite the fuel.

Beware:

- Model engines get very hot while running. Do not attempt to handle them until they have cooled.
- Always run your model engines in a well-ventilated area. Similar to automotive engines, model engines produce possible harmful carbon monoxide fumes.
- Remember that model engines produce a substantial amount of power, more than enough to seriously injure people and/or do considerable damage to property. Always use common sense, skill and constant observation of safety precautions.

Disassembly

Do **not** needlessly disassemble your Saito engine. Only qualified individuals should perform engine repairs. Damage due to improper disassembly will not be covered under warranty. If it becomes necessary to repair the engine, such as after a crash, you can send your engine to the authorized service center at.

Horizon Hobby, Inc.
Attention: Saito Service
4105 Fieldstone Road
Champaign, IL 61822
Phone: (217) 355-9511

Engine Parts Identification

It is important to be able to identify the parts of your Saito engines. Attached you will find an exploded view of a Saito 4-stroke engine, as well as charts that include part numbers and descriptions. This will assist you in easily and rapidly identifying the respective parts of your Saito engine.

Support Equipment

The following items, which are not included with your Saito engine, are necessary in order to operate the model engine:

1. Fuel. For maximum protection and loogevity of Saito engines, Saito recommends a fuel containing 20% oil and 10-15% nitro methane. If this blend is not readily available, the next best selection is a high quality 2-cycle glow fuel, such as Hangar 9 Aero-Blend, Omega, Cool Power, K&B, Power Master, etc. Use of fuels composed entirely of castor oil is not recommended. A mix of synthetic-castor oil is acceptable and can be found in the various fuels described above.

2. Propeller. Refer to the "Propeller Selection" chart, located on page 16, to determine the best initial propeller for your particular application. Propellers should be balanced prior to use.

3. Glow Plug Battery. Your glow plug may be properly beated by

several different sources. The Hangar 9 Power Panel (HAN106), when accompanied by a 12-volt Sealed Lead Acid Battery (HAN102) and a Glow Plug Locking Socket (HAN120) is an ideal source of heat for your glow plug. A conventional 1.5-volt heavy-duty dry cell battery with a Grow Plug Locking Socket (HAN120) or alligator clips may also be used. Additionally, there are several very good glow-starters (nickel cadmium-powered glow plug igniters) that work well.

4. Glow Plug Wrench. Used to remove and tighten glow plugs. The Hangar 9 Long Reach Plug Wrench (HAN2510) is an excellent wrench to utilize, as a longer shaft may be necessary to access the glow plug. This depends mostly upon engine installation.

5. Manual or Electric Starter. For manual starts, a "Start Stick" is highly recommended. Never use your fingers to start any model engine. To do so invites injury. There are a variety of electric starters on the market. The Hangar 9 (tm) Power Pro Heavy Duty12V Starter (HAN162) will work perfectly on all Saito engines.

6. Tachometer. The use of a tachometer for setting the high-speed needle valve prior to flight is encouraged. It will also be helpful when setting the idle adjustment of the carburetor(s).The Hangar 9 (tm) Micro Digital Tachometer (HAN156) is a good choice.

Break-In

The first run on any engine, whether 2-cycle or 4-cycle, is critical to the future of the engine itself. During this time, metal mating parts (piston and cylinder, ball bearings, etc.) wear in. Care must be taken that the engine is clean and free of any dust or grit that may have accumulated while building the model.

There are two accepted methods for breaking in a new engine: test stand mounted and run or aircraft mounted and run. Either method is acceptable: however, mounting the engine to a test stand allows the engine to be observed throughout its operation, as well as elevating it above the ground and away from harmful dust and dirt.

Note: Because your engine may have been sitting for an extended period of time prior to running it, a few drops of light oil applied through the crankcase breather nipple (19 on the exploded view) and down the push-rod tubes (40) will ensure proper lubrication for the first run.

Regardless of the mounting method chosen for break-in, the following procedures are applicable:

1. Use of a fuel as described in the "Support Equipment" section on page 3 of this manual for "break-in" purposes is perfectly acceptable.

2. Your engine includes the Saito SS SAIP 400S glow plug. The Hangar 9 (tm) Four Cycle Super Plug (HAN3011) is a standard replacement to use in these engines.

3. To select the correct propeller, refer to the "Propeller Selection" chart on page 16 of this manual. Remember to balance the propeller prior to use.

4a. For all .30 to .91 engines, ensure that the high speed needle valve (85) is opened (turned counter-clockwise) two and 1/2 turns out. This guarantees a very rich setting.

4b. For all 1.00 to 1.25 engines, ensure that the high speed needle valve (85) is opened (turned counter-clockwise) 5 turns out. This guarantees a very rich setting.

Do not adjust the low-speed needle valve (89) at this time. The low-speed needle valve is preadjusted at the factory for initial break-in. Specific instructions for adjusting the idle of engines (FA-30S(H)) using an "air-bleed" type carburetor will be described in the section "Carburetor Adjustments for Air Bleed Carburetors" on page 7.

5. The use of a tachometer is highly recommended since the adjustment of a 4-cycle engine, while similar to that of a 2-cycle engine, is more difficult to "set by ear," making it much easier to damage the engine by "over-leaning."

Starting The Engine

1. Make sure the glow plug(s) is/are installed and tightened.
2. Be sure the propeller is properly secured. The use of an anti-loosening nut, or “jam nut,” is encouraged on 4-cycle engines.
3. Make sure that the fuel tank line(s) are properly connected. The fuel pickup line should be connected to the carburetor spray bar (84), and the vent line should be connected to the pressure nipple on the muffler. The proper “plumbing” of the lines is extremely important to the performance of any engine. Saito recommends the center of the tank be mounted approximately 5 mm lower than the carburetor center.
4. Be certain that the muffler is installed properly by oiling the threads prior to inserting the muffler into the cylinder head and that the pressure line is properly connected.
5. Fill the fuel tank.
6. Prime the engine:
 - Check to make sure the glow plug is not connected to the heat source (glow plug clip/locking socket)
 - Open the throttle fully

- Rotate the propeller in a counter-clockwise direction 5 to 6 times while plugging the end of the muffler with your finger to draw fuel into the carburetor.

Note: Saito single cylinder engines are now manufactured without the choke valve (92). Due to the excellent fuel draw characteristics of the Saito engines, the use of the choke was determined not to be necessary.

7. Start the engine:

- Turn through the prop 2 to 3 times slowly to ensure that the engine is not hydro-locked (see note below).

Note: When using an electric starter, care should be taken to be sure the engine does not become “hydro-locked” (flooded with fuel). While the electric starter will turn the engine over, it may damage the connecting rod or other components. If the engine becomes hydro-locked, simply remove the glow plug and turn the engine over a few times with the “Start Stick” or electric starter. The excess fuel will be forced to exit the engine via the cylinder head.

- Close throttle to $\frac{1}{4}$ – $\frac{1}{3}$ open position.
- Rotate propeller clockwise until it is against the compression stroke.

- Connect the heating source to the glow plug.
- Using either the “Start Stick” or electric starter, spin the propeller until the engine is running.

Note: A very common error is to remove the glow plug igniter too early. It is suggested that the igniter be left attached until after the engine has been run up and the high-speed needle valve has been properly adjusted.

8. Initial break-in:

Do **not** exceed 4,000 rpm for the first 10 minutes of operation: This allows all parts to mate properly with good lubrication.

Note: Due to the excessively “rich” mixture setting, it may be necessary to leave the heat source attached to the glow plug.

Subsequent runs may be made while slightly leaning out the mixture with each tank full of fuel. Forty minutes is considered sufficient time for normal break-in prior to the first flight.

9. After break-in:

If a test stand was used for the break-in procedure, the engine may now be mounted in the aircraft using a high-quality motor mount such as those available from Saito specifically or for Saito engines.

The idle needle valve (89) (or air bleed needle valve) for the Saito .30S(H)/GK engines) may now be refined. Please refer to the "Carburetor Adjustments" section on page 6 for information on how to do so.

The valves may also be checked at this time. Refer to the "Engine Maintenance" section on page 8 for information on the valve/tappet adjustments.

The use of a tachometer is encouraged for setting the high-speed needle valve (85) prior to flight. The peak rpm should be obtained and then reduced by approximately 200 – 300 rpm by turning the high-speed needle valve counter-clockwise (richen). Each engine's peak rpm can be found on the "Propeller Chart" on page 16. Over-revving of a 4-stroke engine can cause internal damage to the engine.

Carburetor Adjustments for Two Needle Carburetors

The low-speed, or idle needle valve (89), is preadjusted at the factory for best performance during break-in. After break-in it may be necessary to “fine tune” the low speed adjustment using the following procedure:

1. Start the engine and let it warm up prior to attempting any adjustments.

2. Close the throttle slowly and adjust the low speed setting by rotating the idle needle valve (89) clockwise to lean the mixture and counterclockwise to richen the mixture.

Note: The fuel mixture is too irch if when opening the throttle rapidly the engine emits white smoke and “stutters” or “stumbles.” Correct this by rotating the idle needle valve clockwise $\frac{1}{4}$ to $\frac{1}{2}$ trun at a time until the engine transitions smoothly without hesitation upon opening the throttle rapidly.

The fuel mixture may be too lean if the engine stops at the lowest idle position, or when the throttle is rapidly opened from idle. Attempt to correct this by rotating the idle needle valve counterclockwise $\frac{1}{4}$ to $\frac{1}{2}$ turn at a time until the engine transitions smoothly without hesitation upon opening the throttle rapidly. If the situation is not rectified by counterclockwise rotations of the idle needle valve, turn the idle needle valve clockwise in $\frac{1}{4}$ to $\frac{1}{2}$ turn increments.

3. After obtaining the proper idle setting, the low rpm setting may be made through the positioning of the throttle adjustment screw, if applicable. If not, adjust the idle setting via the throttle trim of your transmitter.

Carburetor Adjustments for Air Bleed Carburetors

Note: The Saito FA-30S(H) and FA-30SGK use an air bleed carburetor.

1. Start the engine and let it warm up prior to attempting any adjustments.
2. Close the throttle slowly and adjust the airscrew setting by rotating the airscrew (89) counterclockwise to lean the mixture and clockwise to richen the mixture.

Note: The fuel mixture is too rich if when opening the throttle rapidly the engine emits white smoke and “stutters” or “stumbles.” Correct this by rotating the airscrew counterclockwise $\frac{1}{4}$ to $\frac{1}{2}$ turn at a time until the engine transitions smoothly without hesitation upon opening the throttle rapidly.

The fuel mixture may be too lean if the engine stops at the lowest idle position or if the engine stops when the throttle is rapidly opened from idle. Attempt to correct this by rotating the airscrew clockwise $\frac{1}{4}$ to $\frac{1}{2}$ turn at a time until the engine transitions smoothly without hesitaiionupon opening the throttle rapidly. If the situation is not rectified by clockwise rotations of the airscrew, turn the airscrew counter-clockwise in $\frac{1}{4}$ to $\frac{1}{2}$ turn increments.

3. After obtaining the proper idle setting, the low rpm setting may be made through the positioning of the throttle adjustment screw, if applicable. If not, adjust the idle setting via the throttle trim of your transmitter.

Normal Engine Operation

If break-in was accomplished on a test bench your engine may be mounted to the aircraft and flown. The initial flight should be performed with the engine adjusted for a rich fuel mixture.

1. Your Saito engine should be securely mounted to the aircraft. There are many motor mounts available; however, a high-quality metal mount, such as those manufactured by Saito exclusively for Saito engines, is considered to be the best.

2. General operating procedures that will ensure long engine life are:

- Do not operate the engine with a “lean” mixture.
- Regularly check all screws and nuts on both the engine and muffler.
- After 1 to 2 hours of operation, valve adjustment may be necessary. Adjust the valves as shown in the “Valve/Tappet Gap Adjustment” section on Page 9.
- The Saito engines are equipped with a breather nipple (19). It is recommended that a length of

silicone tubing be attached to this crankcase breather nipple (19) and routed away from the engine compartment so the excess oil can be expelled outside of the aircraft.

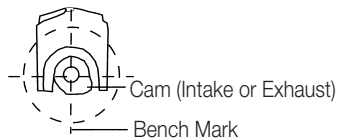
Engine Maintenance

Do not needlessly dismantle your Saito single cylinder engine.

If you must disassemble your single cylinder engine, please refer to the following steps. Remember, a qualified individual should do disassembly.

1. Cylinder screws should be loosened in a criss-cross pattern.
2. Assemble the cam gear lining up the timing mark at the “6 o'clock” position. The crankshaft must be positioned at the “12 o'clock” or “top dead center” (TDC) position (refer to Figure 1 below).

Figure 1



3. Reassemble the piston, rod, rocker arm, pins, pushrod, tappet, etc., in their original positions. Engine parts are mated after running the engine and they must be reassembled as close as possible to their original position.

4. Assemble the engine, reversing the criss-cross pattern used in the disassembly. Prior to tightening each of the screws, apply a drop of oil to prevent thread damage.

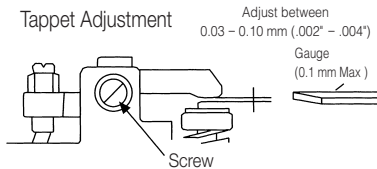
Normal engine maintenance, such as adjusting the valves or carburetor maintenance, is permissible without voiding the warranty. **If you have any questions concerning maintenance procedures, please contact the Saito Service Center at (217) 355-9511.** Our technicians will be happy to advise you on maintenance issues.

Valve/Tappet Gap Adjustment

After approximately one hour of operation, tappet gap adjustment may be necessary. When you check the valves, lubricate the moveable parts. Also make sure the screw is in tight before making adjustments to valves. Adjust the valves to a clearance of .03 mm to .10 mm (.002" – .004") using the supplied gauge. The valves must be adjusted with the engine cold due to thermal expansion.

Note: Valves must be in the compression stroke or closed position as shown in Figure 2 below. When adjustment is completed, make sure you tighten the lock nut.

Figure 2



Carburetor Maintenance

Should you experience difficulty with the carburetor of your engine:

1. Check that the slotted head of the Idle Needle Valve (89) is flush with the throttle arm housing. This will put the idle needle back to the factory preadjusted position.
 2. Remove the high-speed needle (85) and flush out the spray bar with clean fuel. Replace the high-speed needle and follow the instructions in the Carburetor Adjustment section.
 3. Always use a high-quality 4-cycle glow plug. Saito SS (SAIP 400S) or Hangar 9 (tm) Four-cycle Super Plug (HAN3011) is highly recommended.
-

Tips For Extended Engine Life

To add longer life to your Saito engine, the following recommendations are made:

1. Use a high-quality fuel containing 20% lubricants.
2. Use recommended glow plugs.
3. Use the proper propeller size and balance the propeller prior to use.
4. Use a tachometer for precise engine adjustments.
5. Use an “after-run” oil when you’re finished flying for the day. Hangar 9 After Run fuel is recommended.
6. For long-term storage, make sure there is no fuel left in the tank and the engine. Remove the glow plug(s) and apply several drops of high-quality light oil (e.g., a good quality light machine oil or Marvel Air Tool Oil) to the top of the engine, into the glow plug hole, down the pushrod tubes, and through the crankcase pressure vent (breather nipple). Rotate the crankshaft several times. Store the engine in the box or on the airplane with the nose down in order to keep oil in the bearings.

Troubleshooting

Generally speaking, there are very few things that will keep today's modern glow engines from starting. To that end, make sure you're using good quality "fresh" fuel, there are good glow plugs installed, and the starting battery is charged and in good condition. Should the engine fail to start after these items are verified, refer to the following troubleshooting chart on page 12.

SYMPTOM	CAUSE	CORRECTIVE ACTION
Engine fails to start	Low voltage on starting battery	Replace/recharge the starting battery
	Bad glow plug(s)	Inspect/replace bad glow plug
	Insufficient priming	Repeat priming procedure
	“Flooded” due to excessive priming	Disconnect battery, remove the glow plugs, and rotate the propeller several times to “clear” the cylinder
Engine fires but does not run	Over primed	Disconnect battery and rotate propeller several times to “clear” cylinder
Engine starts but slows down and then stops	Mixture too rich	Close high-speed needle valve $\frac{1}{2}$ turn and start again. Repeat until engine is running smoothly.
Engine starts, speeds up, and then quits	Mixture too lean	Open high-speed needle valve $\frac{1}{2}$ turn and start again. Repeat until engine is running smoothly.
Engine quits when starter battery is removed	Mixture too rich	Close high-speed needle valve $\frac{1}{2}$ turn and restart
	Incorrect glow plugs	Change glow plugs
	Incorrect or bad fuel	Change fuel

In the event that none of the above procedures results in the engine running properly, contact our service department for suggestions:

Horizon Service Center
4105 Fieldstone Road
Champaign, Illinois 61822
217-355-9511 (Mon-Fri 8:00-5:00 CST)

Small Single-Cylinder Cross-Reference Chart

PART	NI FA-305-GK	MM FA-305(H)	WW FA40a	XX FA-40aGK	E FA-50	F FA-50GK	U FA-56	JJ FA-56GK
01 Cylinder, Left	30S01	30SH01	40a01	40aGK01	5001B	50GK01B	5601B	56GK01B
06 Piston	30S06	30S06	40a06	40a06	5006	5006	5606	5606
07 Piston Pin	30S07	30S07	40a07	40a07	5007	5007	5607	5607
08 Piston Pin Retainer(6 Pc)	30S08	30S08	5008	5008	5008	5008	6508	6508
08 Piston Ring	60T09	60T09	40a09	40a09	5009	5009	6509	6509
10 Connecting Rod	30S10A	30S10A	40a10	40a10	5010A	5010A	5610	5610
14 Cylinder Screw Set	5014	5014	5014	5014	6014	5014	5014	5014
15 Crankcase	30S15	30SH15	40a15	40aGK15	5015C	50GK15C	5615B	56GK15B
17 Rear Cover (A)	30S17	30SH17	40a17	40aGK17	5017B	50GK17B	5017B	50GK17B
19 Breather Nipple	30S19	30S19	30S19	30S19	5019	5019	5019	5019
20 Front Ball Bearing	30S20A	30S20A	30S20A	30S20A	5020A	5020A	5020A	5020A
22 Rear Ball Bearing	30S22	30S22	40a22	40a22	5022A	5022A	5022A	5022A
23 Crankshaft	30S23	30S23	40a23	40a23	5623A	5623A	5623A	5623A
24 Pinion-Crankshaft	30S24	30S24	--	--	5024	5024	5024	5024
25 Pinion Gear-Pin	5025	5025	--	--	5025	5025	5025	5025
26 Collar, Crankshaft	--	--	--	--	5026	5026	5026	5026
27 Taper Collet & Drive Flange	30S27	30S27	40a27	40a27	5027	5027	5027	5027
28 Prop Washet & Nut	30S28	30S28	40a28	40a28	5628	5628	5628	5628
29 Prop Nut, Spinner	--	--	--	--	--	--	--	--
30 Prop Nut, Electric Starter	30S30	30S30	30S30	30S30	5030A	5030A	5030A	5030A
31 Crankcase Screw Set	30S31	30S31	40a31	40a31	5031	5031	5031	5031
32 Engine Gasket Set	30S32A	30S32A	40a32	40a32	5032B	5032B	5632B	5632B
33 Cam Gear Housing	30S33	30SH33	40a33	40aGK33	5033A	50GK33A	5033A	50GK33A
35 Cam Gear Shaft	30S35	30S35	30S35	30S35	5035	5035	5035	5035
36 Cam Gear Right	30S36	30S36	90R336A	90R336A	5036A	5036A	5036A	5036A
37 Teflon/Steel Washer Set	30S37	30S37	30S37	30S37	5037	5037	5037	5037
38 Tappet (2Pc)	30S38	30S38	30S38	30S38	5038	5038	5038	5038
39 Pushrod (2Pc)	30S39	30S39	40a39	40a39	5039	5039	5039	5039
40 Pushrod Cover Rubber Seal (Pr)	30S40	30S40	40a40	40a40	5040	5040	5040	5040
41 Rocker Arm (Pr)	60T41	60T41	60T41	60T41	5041	5041	5041	5041
42 Rocker Arm Screw Nut (2 Sets)	5042	5042	5042	5042	5042	5042	5042	5042
43 Rocker Arm Pin (2Pc)	30S43	30S43	30S43	30S43	5043	5043	5043	5043
44 Rocker Arm Bracket, Left	--	--	--	--	--	--	--	--
45 Rocker Arm Bracket, Right	--	--	--	--	--	--	--	--
46 Valve-In/Out (Pr)	30S46	30S46	30S46	30S46	5046	5046	5646	5646
47 Valve Spring, Keeper, Retainer (2 Sets)	30S47	30S47	30S47	30S47	5047	5047	5047	5047
48 Valve Retainer (4Pc)	5048	5048	5048	5048	5048	5048	5048	5048
49 Rocker Arm Cover (Pr)	30S49	30S49	30S49	30S49	5049A	50GK49	5049A	50GK49
68 Check Valve-In/Out (Pr)	--	--	--	--	--	--	--	--
69 Intake Manifold, Left	--	--	--	--	5069	5069	5669A	5669A
74 Muffler, Right	30S74	30S74	40a74	40a74	5074D	5074D	5074D	5074D
75 Muffler Manifold, Standard	30S75	30S75	40a75	40a75	5075C	5075C	5075C	5075C
79 Muffler Gasket & (5 Pc)	--	--	40a79	40a79	--	--	--	--
80 Muffler Nut (2 Pc)	30S80	30S80	40a80	40a80	5080A	5080A	5089A	5080A
821 Carburetor-Complete, Left	30S821	30S821	40a821	40a821	50821C	50821C	50821C	50821C
822 Carburetor-Complete, Right	--	--	--	--	--	--	--	--
831 Carburetor Body Assembly, Left	30S831	30S831	40a831	40a831	50831A	50831A	50831A	50831A
84 Spray Bar Assembly	30S84	30S84	40a84	40a84	--	--	--	--
85 High Speed Needle Valve	30S85	30S85	40a85	40a85	10085	10085	10085	10085
86 High Speed Needle Valve Extension	--	--	--	--	5086	5086	5086	5086
87 Throttle Barrel Assembly	30S87	30S87	40a87	40a87	5087A	5087A	5087A	5087A
88 Throttle Lever	30S88	30S88	40a88	40a88	5088B	5088B	5088B	5088B
89 Idle Needle Valve	30A89	30S89	40a89	40a89	5089	5089	5089	5089
90 Carburetor Screw & Spring Set	30S90	30S90	40a90	40a90	5090A	5090A	5090A	5090A
91 Carburetor Gasket Set	30S91	30S91	40a91	40a91	5091B	5091B	5691B	5691B
92 Choke Valve Assembly	--	--	--	--	5092	5092	5092	5092
93 Intake Velocity Stack	--	--	--	--	50GK93	--	--	50GK93
95 Engine Mount	30S95	30S95	40a95	40a95	5095	5095	5095	5095
96 Tool Set	30S96	30S96	30S96	30S96	6596A	6596A	6596A	6596A
97 Instruction Manual	MAN1	MAN1	MAN1	MAN1	MAN1	MAN1	MAN1	MAN1
102 Fuel Pump System	--	--	--	--	--	--	--	--
109 F-1 Fuel Filter	50109	50109	50109	50109	50109	50109	50109	50109
110 Anti-Loosening Nut	--	--	40a110	40a110	56110	56110	56110	56110
111 Flexible Exhaust Pipe	--	--	--	--	--	--	--	--
112 Tuned Silencer	--	--	--	--	--	--	--	--
114 Engine Bed	--	--	--	--	50114	50114	50114	50114
116 M3 Nut for Spinner	--	--	--	--	50116	50116	50116	50116
117 M4 Nut for Spinner	--	--	--	--	--	--	--	--
118 M5 Nut for Spinner	--	--	--	--	--	--	--	--
122 Spray bar with internal p-2/External p-5"0"ring	--	--	--	--	65122A	65122A	65122A	65122A
135 Prop Washer/Nut/Anti-loosening Nut	--	--	40a135	40a135	56135	56135	56135	56135
136 Intake Manifold	--	--	--	--	--	--	--	--
137 Prop Washer	--	--	--	--	--	--	--	--
145 Spray bar with internal p-2"0"ring	--	--	--	--	--	--	--	--
151 Muffler Nut	--	--	--	--	--	--	--	--

Medium Single-Cylinder Cross-Reference Chart

PART	K	EE	QQ	UU	AG	AH
	FA-91S	FA-91SGK	FA-100	FA-100GK	FA-125a	FA-125aGK
01 Cylinder, Left	91S01A	91SGK01A	10001	100GK01	125a01	125aGK01
06 Piston	91S06	91S06	10006	10006	125a06	125a06
07 Piston Pin	91S07	91S07	10007	10007	120S07	120S07
08 Piston Pin Retainer (6 Pc)	6508	6508	6508	6508	120S08	120S08
09 Piston Ring	91S09	91S09	10009	10009	125a09	125a09
10 Connecting Rod	6510C	6510C	10010	10010	125a10	125a10
14 Cylinder Screw Set	6514	6514	6514	6514	6514	6514
15 Crankcase	91S15	91SGK15	10015	100GK15	125a15	125aGK15
17 Rear Cover (A)	91S17	91SGK17	10017	100GK17	10017	100GK17
19 Breather Nipple	6519	6519	6519	6519	6519	6519
20 Front Ball Bearing	91S20A	91S20A	91S20A	91S20A	120S20A	120S20A
21 Rear Ball Bearing	—	—	300T21	—	—	—
22 Rear Ball Bearing	91S22A	91S22A	—	—	120S22	120S22
23 Crankshaft	91S23A	91S23A	10023	10023	125a23	125a23
24 Pinion-Crankshaft	—	—	—	—	—	—
25 Pinion Gear-Pin	—	—	—	—	—	—
26 Collar, Crankshaft	—	—	—	—	—	—
27 Tapered Colllet & Drive Flange	6527	6527	6527	6527	125a27	125a27
28 Prop Washer & Nut	5628	5628	10028	10028	125a28	125a28
29 Prop Nut, Spinner	—	—	120S29	120S29	120S29	120S29
30 Prop Nut, Electric Starter	5030A	5030A	10030	10030	120S30	120S30
31 Crankcase Screw Set	5031	5031	5031	5031	5031	5031
32 Engine Gasket Set	91S32A	91S32A	10032	10032	125a32	125a32
33 Cam Gear Housing	6533B	65GK33B	170R333	100GK33	170R333	100GK33
35 Cam Gear, Right	6535A	6535A	6535A	6535A	6535A	6535A
36 Cam Gear Shaft	5036A	5036A	179R336A	170R336A	170R336A	170R336A
37 Teflon/Steel Washer Set	5037	5037	125a-37	125a-37	125a-37	125a-37
38 Tappet (2Pc)	5038	5038	5038	5038	5038	5038
39 Pushrod (2Pc)	91S39	91S39	10039	10039	200T39	200T39
40 Pushrod Cover Rubber Seal (Pr)	60T40	60T40	10040	10040	90T540	90T540
41 Rocker Arm (Pr)	5041	5041	5041	5041	5041	5041
42 Rocker Arm Screw Nut (2 Sets)	5042	5042	5042	5042	5042	5042
43 Rocker Arm Pin (2Pc)	5043	5043	5043	5043	5043	5043
44 Rocker Arm Bracket, Left	—	—	—	—	—	—
45 Rocker Arm Bracket, Right	—	—	—	—	—	—
46 Valve-In/Out (Pr)	91S46	91S46	10046	10046	125a46	125a46
47 Valve Spring, Keeper, Retainer (2 Sets)	6547	6547	6547	6547	6547	6547
48 Valve Retainer (4Pc)	5048	5048	5048	5048	5048	5048
49 Rocket Arm Cover (Pr)	5049A	50GK49	5049A	50GK49	5049A	60GK49
68 Check Valve-In/Out (Pr)	—	—	—	—	—	—
69 Intake Manifold, Left	91S69	91S69	10069	10069	125a69	125a69
74 Muffler, Right	91S74C	91S74C	91S74C	91S74C	125a74	125a74
75 Muffler Manifold, Standard	8075C	8075C	8075C	8075C	125a75	125a75
79 Muffler Gasket (5 Pc)	—	—	—	—	—	—
80 Muffler Nut ※(2 Pc)	8080A(1Pc)	8080A(1Pc)	8080A(1Pc)	8080A(1Pc)	125a80	125a80
821 Carburetor-Complete, Left	91S821D	91S821D	100821	100821	125a821	125a821
822 Carburetor-Complete, Right	—	—	—	—	—	—
831 Carburetor Body Assembly, Left	91S831B	91S831B	100831	100831	125a831	125a831
84 Spray Bar Assembly	—	—	—	—	—	—
85 High Speed Needle Valve	10085	10085	10085	10085	10085	10085
86 High Speed Needle Valve Extension	5086	5086	5086	5086	5086	5086
87 Throttle Barrel Assembly	91S87A	91S87A	10087	10087	125a87	125a87
88 Throttle Lever	5088B	5088B	5088B	5088B	5088B	5088B
89 Idle Needle Valve	130T89	130T89	130T89	130T89	125a89	125a89
90 Carburetor Screw & Spring Set	91S90	91S90	91S90	91S90	125a90	125a90
91 Carburetor Gasket Set	91S91A	91S91A	10091A	10091A	125a91	125a91
92 Chode Valve Assembly	5092	5092	—	—	—	—
93 Intake Velocity Stack	—	50GK93	—	—	—	—
95 Engine Mount	6595	6595	10095	10095	10095	10095
96 Tool Set	6596A	6596A	6596A	6596A	125a96	125a96
97 Instruction Manual	MAN1	MAN1	MAN1	MAN1	MAN1	MAN1
102 Fuel Pump System	—	—	—	—	—	—
109 F-1 Fuel Filter	50109	50109	50109	50109	50109	50109
110 Anti-Loosening Nut	56110	56110	170R3110	170R3110	125a110	125a110
111 Flexible Exhaust Pipe	65111	65111	65111	65111	125a111	125a111
112 Tuned Silencer	65112A	65112A	65112A	65112A	—	—
114 Engine Bed	—	—	—	—	—	—
116 M3 Nut for Spinner	—	—	—	—	—	—
117 M4 Nut for Spinner	65117	65117	120S117	120S117	120S117	120S117
118 M5 Nut for Spinner	65118	65118	120S118	120S118	120S118	120S118
122 Spray bar with internal p-2/External p-5"O'ring	91S122B	91S122B	91S122B	91S122B	91S122B	91S122B
135 Prop Washer/Nut/Anti-loosening Nut	56135	56135	100135	100135	125a135	125a135
136 Intake Manifold	—	—	—	—	—	—
137 Prop Washer	—	—	—	—	—	—
145 Spray bar with internal p-2"O'ring	—	—	—	—	—	—
151 Muffler Nut ※(1 Pc)	91S151	91S151	91S151	91S151	—	—

Propeller Selection

In the chart below you will find a propeller selection list. This chart will enable you to select the best propeller for initial setup of your Saito engine.

Remember, it is imperative to balance each propeller prior to installation onto your Saito engine. Failure to do so may cause unwanted vibration in your aircraft.

Figure 5

You will note a letter (A, B, C, etc.) stamped on the top of the motor mount. This letter identifies the production version of your engine. Should you ever need to order a part or have a question pertaining to your engine, specify this letter along with the engine type. This will allow for easier identification of your engine.

Saito Single-Cylinder Propeller Chart

NOTE: All recommendations are based on engines using APC props, Power Master 15% 2-stroke fuel, and Saito SAIP 400S glow plugs.

ENGINE	SPORT	SCALE	AEROBATICS
FA-30S(H)/30SGK 2,200 – 12,000rpm	10×5	10×5, 10×6	9×6, 10×5
FA-40a/40aGK 2,200 – 12,000rpm	10×7, 10.5×6, 11×5, 11×6	11×5, 11×6	10×7, 10.5×6, 11×5
FA-50/50GK 2,000 – 12,000rpm	11×7, 11×8, 12×6	12×5, 12×6	11×7, 11×8, 12×6
FA-56/56GK 2,000 – 12,000rpm	11×8, 12×6, 12×7	12×6, 12×7	11×8, 12×6, 12×4
FA-65/65GK 2,000 – 11,600rpm	12×6, 12×8, 13×8	13×8, 14×5, 14×6	11×9, 12×8, 13×6
FA-72/72GK 2,000 – 12,000rpm	12×8, 13×6, 13×8, 14×6	13×6, 13×8, 14×6, 15×4	11×9, 11×10, 12×8, 12×9
FA-80/80GK 2,000 – 11,600rpm	12×3, 13×6, 13×8, 14×6	13×6, 13×8, 14×6, 15×4	11×9, 11×10, 12×8, 12×9
FA-82a/82aGK 2,000 – 12,000rpm	12×8, 13×7, 13×8, 14×6, 14×8	13×7, 13×8, 14×5, 14×6, 15×4	11×10, 11×11, 12×9, 12×10N, 13×9
FA-91S/91SGK 2,000 – 11,000rpm	12×8, 13×7, 13×8 14×6, 14×8	13×7, 13×8, 14×5, 14×6, 15×4	11×10, 11×11, 12×9, 12×10N, 13×9
FA-100/100GK 2,000 – 11,000rpm	13×9~13×11, 14×6~14×10	14×8~14×10 15×6~15×8	13×11, 13.5×10, 14×10
FA-125a/125aGK 2,000 – 11,000rpm	15×6~15×8 16×6~16×8 17×6	16×6~16×8 17×6	15×6~15×8

NOTE: Observe operating rpm ranges as excessive rpm can result in damage to the engine.

Figure 6

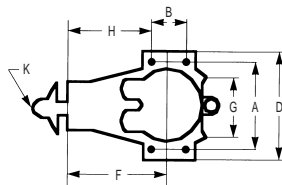
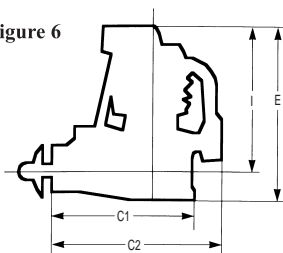


Figure 7

OUTSIDE DIMENSIONS (mm)

Items	A	B	B1	B2	C1	C2	D	E	F	G	H	I
FA-30S(H)/FA-30SGK	36	14	—	—	65	85	43	88	47	29	40	73
FA-40a/FA-40aGK	36	15	—	—	73	88	45	93	53	31	40	76
FA-50/FA-50GK	46	15	—	—	60	104	54	104	59	32	52	87
FA-56/FA-56GK	46	15	—	—	60	104	54	104	59	32	52	87
FA-65/FA-65GK	50	21	—	—	93	116	60	117	66	40	55	97
FA-72/FA-72GK	46	15	—	—	85	104	56	111	60	35	53	93
FA-80/FA-80GK	50	21	—	—	93	116	60	117	66	40	45	97
FA-82a/FA-82aGK	46	15	—	—	65	104	56	111	60	35	53	93
FA-91 Special/FA-91SGK	50	21	—	—	93	116	60	117	65	40	55	97
FA-100/FA-100GK	52	25	—	—	95	115	60	128	69	43	57	106
FA-125a/FA-125aGK	52	25	—	—	96	119	60	127	70	43	53	105

Figure 8

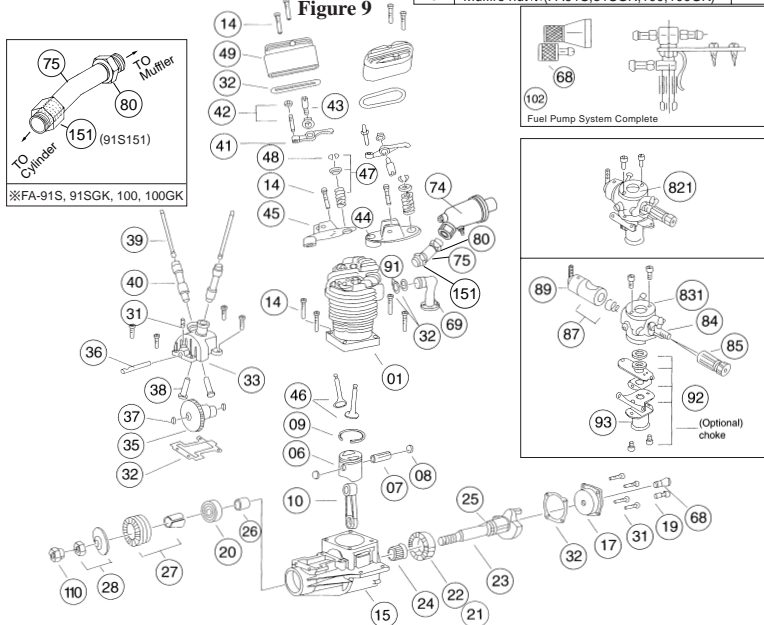
SPECIFICATIONS

Items	Disp (cc)	Bore (mm)	Stroke (mm)	Weight (g)	K (ISO)	Cylinder	HP
FA-30S(H)/FA-30SGK	5.03	20.0	16.0	260	1/4 × 28	— AAC	0.5
FA-40a/FA-40aGK	6.0	22.0	17.4	300	1/4 × 28	— AAC	0.65
FA-50/FA-50GK	8.2	23.4	19.1	435	M7 × 1	— ABC	0.85
FA-56/FA-56GK	9.2	24.8	19.0	410	M7 × 1	— AAC	0.7
FA-65/FA-65GK	10.6	24.8	22.0	550	M7 × 1	— AAC	0.95
FA-72/FA-72GK	11.8	27.0	20.6	470	M7 × 1	— AAC	1.7
FA-80/FA-80GK	13.1	27.0	22.8	540	M7 × 1	— AAC	1.3
FA-82a/FA-82aGK	13.0	29.0	20.4	462	M7 × 1	— AAC	1.5
FA-91 Special/FA-91SGK	15.0	28.2	24.0	520	M7 × 1	— AAC	1.6
FA-100/FA-100GK	17.1	29.0	26.0	550	M8 × 1.25	— AAC	1.8
FA-125a/FA-125aGK	20.5	31.7	26.0	520	M8 × 1.25	— AAC	2.2

No.	Description	Qty.
01	Cylinder (left)	1
06	Piston	1
07	Piston pin	1
08	Piston pin retainer	2
09	Piston ring	1
10	Connecting rod	1
14	Cylinder screw set	1 set
15	Crankcase	1
17	Rear cover	1
19	Breather nipple	1
20	Front bearing	1
22	Rear bearing	1
23	Crankshaft	1
24	Pinion (crankshaft)	1
25	Pinion gearpin	1
26	Collar (crankshaft)	1
27	Taper collet & drive flange	1 each
28	Prop washer & nut	1 set
29	Prop nut-spinnet	1 set
30	Prop nut-electric starter	1 set
31	Crankcase screw set	1 set
32	Engine gasket set	1 set
33	Cam gear housing	1
35	Cam gear	1
36	Cam gear shaft	1
37	Steel washer set	1 set
38	Tappet	2

No.	Description	Qty.
39	Pushrod	2
40	Pushrod cover & rubber seal	2 each
41	Rocker arm	2
42	Rocker arm scraw & nut	2 each
43	Rocker arm pin	2
44	Rocker arm bracket (left)	1
45	Rocker arm bracke t(right)	1
46	Valve (in & out)	2
47	Valve spring & keeper & retainer	2 each
48	Valve retainer	2
49	Rocket arm cover	2
68	Checkvalve (in & out)	1 pair
69	Intake manifold	1
74	Muffler	1
75	Muffler manifold	1
77	Muffler gasket	5
80	Muffler nut	2
89	Idle needle valve	1
821	Carburetor complete	1 set
831	Carburetor body assembly	1 set
84	Spray bar assembly	1
85	High speed needle valve	1 set
87	Throttle barrel assembly	1 set
91	Carburetor gasket set	1 set
93	Intake velocity stack	1 set
102	Fuel pump system complete	1 set
110	Anti-loosening nut	1
151	Muffler nut ※(FA91S,81SGK,100,100GK)	1

Figure 9



FA-100/100GK(Main ball bearing)

Consumer Warranty and Repair Policy

Saito engines are guaranteed against workmanship and manufacturing defects for a period of 3 years from the original date of purchase. This warranty is limited to the original purchaser of the engine and is not transferable. Warranty repairs will **not** cover:

- Normal engine wear
- Damage due to insufficient maintenance
- Damage related to over-revving of engine due to small prop size or unreasonable use
- Rusted bearings
- Crash damage
- Damage due to use of improper fuel and/or glow plug
- Damage due to lean runs, such as rusted bearings, seized connecting rod or piston, etc.
- Damage caused by foreign objects (dirt or broken glow plug filaments)
- Damage caused by unreasonable mounting or running conditions (dust, insufficient cooling, improper mounting, improper propeller size, or lack of balancing, etc.)
- Damage due to improper disassembly
- Modifications of any kind

If your engine needs repair, please do the following:

1. Ship your engine in its original box, freight prepaid to:

Horizon Service Center
Attn: Saito Service
4105 Fieldstone Road
Champaign, IL 61822
Phone: (217) 355-9511

Include complete name and address information inside the carton, as well as clearly writing it on the outer label/return address area.

2. Include a note containing a brief summary of the difficulty and include the following information:

- Nitro content and brand of fuel
- Propeller size and brand used
- Type of glow plug used
- Type of engine mount
- Approximately how much running time the engine had before difficulty

Date your correspondence and be sure your name and address appear on this enclosure. Also, include a phone number where you can be reached during the business day.

Warranty Repairs

To receive warranty service, you must include your original dated sales receipt to verify your proof-of-purchase date. Providing that warranty conditions have been met, your engine will be repaired without charge.

Non-Warranty Repairs

Should your repair cost exceed 50% of the retail purchase cost, you will be provided with an estimate advising you of your options. Any return freight for non-warranty repairs will be billed to the consumer.

Please advise us of the payment method you prefer to use. The Horizon Service Center accepts VISA, MasterCard, or money orders. If you prefer to use a credit card, include your card number and expiration date.

The Consumer Warranty Registration in the back of this manual must be completely filled out and mailed to:

Horizon Service Center
Attn: Saito Warranty
4105 Fieldstone Road
Champaign, IL 61822



Please cut on dotted line

Consumer Warranty Registration

Complete this form and mail along with your dated sales receipt (send copy, keep original for your files) within 10 days of purchase to: Horizon Service Center

Attn: Saito Warranty Dept.
4105 Fieldstone Road
Champaign, IL 61822

Engine Type _____

Date of Purchase _____

Owner's Name _____

Street Address _____

City/State/Zip _____

Daytime Phone Number _____

Purchased From: _____

Dealer's Name _____

Street Address _____

City/State/Zip _____



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