OPERATING INSTRUCTIONS - SAGA 27

Contents:

1. INTRODUCTION

These instructions present a number of essential items of information on the maintenance and use of this boat. We recommend that you take the time to read these thoroughly before starting to use the boat. This will give you an understanding of the boat's construction and design.

Your adherence to these instructions will do much to prevent the occurence of problems which can lead to bothersome and potentially dangerous situations.

These instructions deal primarily with the standard equipment with which the boat is outfitted. With respect to optional equipment, please refer to the separate user instructions supplied with the equipment.

With this, we wish you the best of luck with your new SAGA boat.

Yours faithfully
SAGA TRADING AS

2. DESIGN, DIMENSIONS AND WEIGHT

The SAGA 27 is made of fibreglass-reinforced polyester, fabricated by hand throughout. The separate components are cast in moulds with core materials of waterpoof marine plywood or PVC foam where required for strenght or insulation. The hull is fabricated in a simple laminated construction in which integral furnishing stiffen and provide structural reinforcement.

Hull type: Displacement

Boat dimensions:

Lenght excl. stern platform/ladder	815 cm
Lenght incl. stern platform/ladder	830 cm
Beam between fender strips	275 cm
Height excl. lantern mast	295 cm
Total height incl. lantern mast	360 cm
Draft (depending on load)	approx 85 cm
Weight w/standard equpment, excl. fuel and wate	approx 2.400 kg

Speed: Ideal cruising speed: 7 - 13 knots/hour

Tank capacities:

Main fuel tank	170 l
Reserve fuel tank	170 l
Fresh water tank	150 l
Holding tank	70 l

3. ENGINE AND PROPELLER UNIT

The SAGA 27 is powered by one diesel engine located beneath the cockpit deck, mounted on flexible rubber blocks fastened to the engine base by means of bolts screwed into steel plates imbedded in the hull.

Power transmission is by means of a straight propeller shaft penetrating the stern end of the keel fin through a sleeve and packing box. A 3-bladed bronze propeller is fitted.

The packing box is equipped with a grease cup which must be kept filled with marine lubricant.

The grease cup is located on the engine's compartment. After each trip, give the cup 1/2 - 1 turn, and check that there is no water seeping from the packing box. If there is still seepage, turn the grase cup until seepage stops.

Cooling system:

The engine is cooled indirectly by means of a heat exchanger. This incorporates a double circulation system with two separate sides, a closed side (as in automobile engines) and an open side.

In the closed side of the system the coolant circulates through the cavities in the engine block and carries excess heat out to the heat exchanger.

In the heat exchanger, the hot coolant is cooled by the open side of the system, which takes in cold seawater from outside and circulates it past the coils in the heat exchanger.

A termostat on the closed side controls the flow of engine coolant, maintaining an even temperature in the engine. Heat is also removed through the hot water heater and the defroster system.

Each of the two sides of the cooling system has its own circulation pump. The pump on the closed side is maintenance-free, and is belt-driven off the engine. The pump on the open side has a rubber impeller which must be inspected at maintenance intervals and replaced if necessary (see engine manual). Cold seawater in the open side ot the system is drawn in through a seacock connected to the system via a hose.

IMPORTANT - Ensure that the seacock is always fully open whenever the engine is running

Exhaust passes out of the boat through the exhaust hose which is equipped with a muffler located in the engine's compartment, and connects with a skinfitting in the hull. The exhaust line is cooled by discharging the open cooling system water through the exhaust hose.

IMPORTANT - Whenever the engine is running, there should always be water running out of the exhaust pipe. If this is not happening, stop the engine immediately, or else the exhaust line may overheat and catch fire.

Alarm system:

Cooling system overheating is signalled by a red warning lamp on the instrument panel and an acoustic alarm. This indicates that one of the following has occured:

- Water intake in hull plugged
- Hose between seacock and engine damaged or defective
- Pump impeller defective
- Drive belt loose or defective

- Low coolant level in closed system
- Excessive anti-freeze concentration (max 50%)
- Other causes (contact marine repair shop)

Oil system failure is signalled by a red light and acoustic alarm on the instrument panel. This indicates one of the following:

- Low engine oil level
- Other oil system fault (contact marine repair shop)

Generator failure is signalled by a red light on the instrument panel (or by the volt meter reading). Poor charging indicates one of the following:

- Loose or defective drive belt
- Poor connections between generator, engine and battery
- Faulty generator
- Other causes (contact marine repair shop)

MAINTENANCE

Engine operation, inspection and maintenance are outlined in the engine manual. Read this throughly.

Before every trip

- Check engine and transmission oil levels. Top up if necessary.
- Check coolant level in heat exchanger. Top up if necessary.

At maintenance intervals

- Thighten all hose clamps on engine, propeller and exhaust system (do not tighten so hard that the hoses or hose clamps are damaged)

- Check and adjust the alignment of the engine with the propeller shaft if necessary (this must be done by competent mechanics).

Perform other maintenance operations according to engine manual.

4. FUEL SYSTEM

Engine fuel is held in two tanks:

Main fuel tank

The main fuel tank is located on the starbord side of the engine compartment and holds 170 liters. The engine takes fuel from the main tank via a fuelline leading from the top of the tank to the engine. A coarse filter (water trap) fitted to the fuel line removes coarse particles and water before the fuel reaches the engine. The lift pump draws more fuel than the engine uses, so the excess isrouted back to the tank via the overflowline which also enters at the top of the tank.

Reserve fuel tank

The reserve fuel tank is located on the port side and is connected to the main tank by means of a transfer line traversing the engine compartment. A three-way ball valve is fitted to this line at the entrance to each tank. Opening this valve (valve arm lining up with fuelline) allows fuel to run from the reserve tank into the main tank, equalizing the levels in the two tanks. When the tanks are full, these valves should be kept closed. Only when the level of the main tank starts to get low should this line be opened.

Filling fuel

The fuel tanks are filled through the filler inlets on the dollboards on either side of the boat. Do not fill too fast - allow the air in the tank to escape through the air vent. Before replacing the filler cap after filling, it's a good idea to lube the threads with a small amount of grease to keep the cap turning easily and to prevent water from leaking into the tank.

IMPORTANT - Never run the tanks dry, as air will then be drawn into the diesel injection system. If this happens the engine will not start until the system is vented.

MAINTENANCE

If water or impurities enter the tanks, they may be drained off through the drainage plugs located at the bottom of the tanks, in the bulkhead on each side of the engine. This should be done if there is any suspicion of impurities, otherwise at each maintenance interval and at the end of the season.

For venting of diesel injection system, see engine manual.

5. DIESEL FUEL AND ENGINE OIL

The engine is designed to run on normal quality diesel fuel designated "Auto diesel" or "Marine diesel". Lower grades will lead to greater wear and reduced engine performance, and must not be used.

Fuel must be clean and free from water. Water and impurities in diesel fuel block passageway and stop the engine, as well as leading to rust damage in pump and injectors. Normal diesel fuel may be used in temperatures as low as -12 degrees Celcius. For use at lower temperatures, obtain the advice of the engine supplier.

Engine oil See engine manual

6. STEERING SYSTEM

The SAGA 27 is outfitted with a mechanical steering system, where the movements from the steering wheel is transferred to the steering arm by means of a stiff cable running in a sleeve. At its rear part this cable ends in a traction bar, attached to the steering arm with a bolt.

MAINTENANCE

Ensure that the bolt linking the steering arm and the traction bar and also the ball attachment keeping the bar in its place, are well thightened. Also ensure that the wire limiting the rudder angle is correctly adjusted. This is to stop the movement of the steerimg arm just before the traction bar is in its utter position.

7. RUDDER ASSEMBLY

Rudder

The rudder is of fibreglass. The lower end turns in the rudder support. In the upper end the stem is penetrating the hull through a molded rudder sleeve with an integral bearing and a packing box on the top.

Pacing box

The packing box is provided with a grease cup.

Steering arm

The steering arm is attached to the top end of the rudder stem and fastened by means of a slot key and a setscrew.

Emergency steering

The emergency tiller is located over the steering arm. To use, attach to top and use as a tiller. If necessary, the steering cylinder and steering arm may be disconnected by removing the connecting bolt.

MAINTENANCE

Ensure that there is always grease in the grase cup, giving it a turn now and then.

Inspect the nylon bearing at the bottom of the rudder once each year, and replace if necessary. At the same time, check and tighten all external screws and bolts.

8. CONTROLS

Single lever control

With this type, both forward/reverse and gas are cotrolled with the same lever. This lever has three positions/ranges:

- Middle position	Transmission in neutral, motor at idle
- Forward	Transmission coupled, propeller turning in forward direction. Pushing the lever forward increases speed
- Back	Transmission coupled, propeller turning in reverse direction. Pulling the lever back increases reverse speed

IMPORTANT - When starting motor, the control lever must always be in neutral. For extra gas during starting, the button in the center of the lower part of the lever may be pushed in while pushing the lever forward. The transmission will then remain in neutral until the lever is pulled back to neutral again.

General instructions on use of control

Always operate the lever using precise movements between positions. Never leave levers in intermediate positions.

Never move gear lever directly from forward to reverse or vice versa at high engine speeds. Reduce engine speed to idle first.

MAINTENANCE

Lever movements are transmitted to the engine via cables. To ensure optimum operation, these must be properly adjusted. They have been adjusted at the factory, but in time, they will need readmutment. The cables and levers must therefore be checked at each engine maintenance interval and adjusted if necessary. You should also note any changes in operation characteristics.

You should also take particular care that the cables do not loosen from their fastenings on the engine or in the control box. Adjustments should be performed by trained mechanics.

9. THE ELECTRICAL SYSTEM

Generator

The generator charges two separate batteries, one for the starter motor and one for the general service system. The batteries are charged simultaneously while the engine is running, but separated completely when the engine stops. This prevents the service system from draining the start battery.

Batteries

The batteries are located in a separate case beneath the deck.

Main switches

The main swithces are located on the engine compartment bulkhead.

Fuse box

The service system fuse box is located on the hatch beneath the dashboard. It features circuit breakers that open for overloads and have to be exchanged. A circuit breaker that will not reset indicates a continuing overload or a short-circuit. In either case, the cause must be investigated and pin-pointed.

Schematic diagram

The engine electrical system chematic is printed in the engine manual. The service system chematicis provided separately.

MAINTENANCE

Always maintain a sufficient level of electrolyte in the batteries, topping up with destilled water if necessary to keep the level above the plates.

Never run the batteries completely down, ensure that they maintain a sufficient charge at all times. Repeated deep discharges will in time ruin the batteries so that they no longer take a charge. Poor battery condition also causes electronic equipment to function poorly, and may damage such equipment (damage due to poor battery condition is not covered by warranties).

During winter storage the batteries shold be removed, inspected and kept charged until the next season. This will prolonge the life of the batteries.

Additional equipment must either be connected directly to the service battery via a fused curcuit, or via the connecting boxes in the dashboard. Additional equipment must not be connected to existing wiring.

10. HEATER/DEFROSTER SYSTEM

The SAGA 27 is provided with two separate heating systems:

Diesel space heater

The diesel-fueled space heater is mounted on the starboard side at the helmsman's seat (beneath the dollboard). It is operated from the control panel on the bulkhead of the toilet room in the fore cabin and works automatically, taking fuel from the starboard fuel tank. The On/Off switch has three positions:

Middle : Off
Right : Heat and fan on
Left : Fan only (ventilation)

There is also a thermostat in the main cabin forsetting the desired temperature.

Observe that this heater has an afterburning period, which means that the heater will continue running after being shut off until combustion is completed and the heater is cooled down sufficiently.

It is essential that the heater operates on adequate voltage (min 10.5 volts).

MAINTENANCE

See separate instruction book

Radiator heat/defroster

The radiator heating unit is located in the battery case. This system works on the same principle as a car heater. Hot water from the closed side of the engine's cooling system circulates through the heating unit and returns to the engine. A fan forces air through the radiator matrix, into the warm-air ducts and out through the vents under the front windscreens, in the fore cabin and the cockpit. The vents in the cabin and the cockpit must be closed whenever maximum defrosting capacity is required.

The radiator heater does not begin to heat until the engine has reached working temperature. This heater is operated from the panel on the dashboard.

MAINTENANCE

Aside from periodic inspection of hoses and hose clamps, the radiator unit requres no mainenance.

11. COOKING STOVE (extra equipm)

The cooking stove works automatically, and features a closed combustion chamber with a ceramic cooktop.

Fuel

The cooking stove burns clear kerosene (paraffin) of lamp oil or similar grade. Lower grade than this must not be used. The fuel tank is located in the galley cabinet underneath the stove.

IMPORTANT - When filling or replacing fuel tank, ensure that the hoses lead straight up towards the stove, and that they are free from kinks and defects.

MAINTENANCE AND OPERATION

See separate instruction manual.

NOTE - Your boat may have a different cooking stove installed. See separate instruction manual.

12. FRESH WATER SYSTEM

Water tank

The 150 ltr water tank is located underneath the deck in the front cabin with the filler on the fore deck. Do not fill tank too fast - give the air in the tank time to escape.

Electric pressure pump

The pump is located in the bench on the starboard side of the front cabin, and goes on automatically when one of the faucets is opened. The switch labelled "Pantry Pump" on the instrument panel must be in the "On" position. This may be used to stop the pump in case of leaks.

Hot water heater (extra equpment)

The hot water heater is located in the cupboard underneath the helmsman's seat. This takes hot water from the closed side of the engine's cooling system via the same supply line as the radiator heat system.

The fresh water system

is pressurized by the pressure pump when this is turned on.

MAINTENANCE

All hoses, clamps and connections should be inspected and tightened if necessary.

During winter storage or when there is any likelihood of freezing temperatures, the fresh water system must be drained as follows:

1. Empty the tank by means of the pressure pump
2. Open all faucets
3. Loosen hose clamps on the pump and run dry
4. Empty hot water heater by turning the handle on the pressure relief valve 1/2 turn until water runs out the overflow pipe.
   Let all the water run out.

NOTE!

When the tank is empty, the pump must be turned off using the "Pantry Pump" switch. If not, the pump will run continuously until it is ruined, even though all faucets are closed.

13. WASTE WATER SYSTEM

The marine toilet

The marine toilet flushes to the holding tank. Next to the pump handle is another handle labelled "Flush - Dry Bowl". To flush toilet, turn this handle to "Flush". The pump then takes in seawater while flushing to holding tank. When finished, turn handle to "Dry Bowl", and pump the toilet dry.

The intake seacock, located under the midships cabin floor, must be open (handle aligned with hose).

Holding tank

The holding tank is located on the port side of the stowage compartment. When full, empty by means of the hand pump located on the bulkhead adjacent to the engine compartment. Make sure the foot valve is open.

IMPORTANT: The bottom valve for emptying the waste holding tank shall only be open while emptying the tank. Please always keep the valve closed.

MAINTENANCE

All hoses, clamps and connections should be inspected and tightened if necessary. During winter storage or when there is any likelihood of freezing temperatures, the toilet, holding tank, flushing pump and shower pump must be drained. After draining, a small amount of 50% anti-freeze solution may be poured into the waste water system.

The foot valve housing should be lubricated occasionally. This should be done while boat is ashore. Loosen the two screws on the top of the valve. Remove housing and lubricate with grease.

IMPORTANT - Use only normal toilet paper in the toilet. Other types of paper, sanitary napkins, etc. will clog the system immediately, requiring a thorogh cleanout.

Empty the holding tank before it becomes completely full. Pumping into a tank that is already full, may cause the system to back up into the toilet or rupture a hose.

14. BILGE PUMPING SYSTEMS

Hand pump

One hand pump is located in the side panel behind the pantry bench, and pumps out the engine compartment.

Pumping out the forecabin

The forecabin bilge is emptied by opening a gate valve in the rear part of the forecabin floor, and allowing the water to run into the engine compartment, from where it is then pumped out. This valve should be kept shut.

Pumping out the battery compartment

The battery compartment bilge is emptied by opening a gate valve in the forward engine compartment bulkhead. Normally this valve should be kept shut.

Pumping out the aft cabin

Open he gate valve in the aft engine compartment bulkhead and let the water run into the engine compartment, from where it is then pumped out. Normally this valve should be kept shut.

MAINTENANCE

Hoses, clamps and connections should be inspected periodically. Inspect suction hoses and strainers as well.

Check float switch power supply by lifting the float, which should cause the pump to start.

Keelboxes and pumping wells should be kept free from debris that can clog the bilge pumping system. Ensure that the runnoff openings are not obstructed.

15. REFRIGERATOR

The refrigerator is regulated by a thermostat switch inside the refrigerator. There is also a toggle switch for quick cooling (switch "on", red light). Refrigerator current comes through the main service system switch.

16. VENTILATION

Electric ventilator fan

The ventilator fan is in the lavatory roof vent.

Side vents

There are side vents in the fore- and aft cabin at the side windows.

Additional ventilation

The heating/defroster system may be used for additional ventilation, and can blow both hot and cold air.

The forecabain is provided with an adjustable ventilation hatch which also functions as an emergency exit.

Leave the side vents open when the boat is not in use.

17. INTERIOR

Wood furnishings

The woodwork is made from waterproof grades of solid wood and given a low-gloss industrial finish with an acid-based varnish.

Cushions and textiles

Cushions and textiles are of normal interior grades, and may be washed or cleaned accordingly. They are not machine-washable.

MAINTENANCE

Teak polish is suitable for general woodwork care. For repairing damaged surfaces, use a good quality, low-gloss alkyd varnish. For other maintenance, normal household grade cleanears and detergents are recommended.

18. EXTERIOR

To keep your boat looking its best, it is essential to maintain the exterior components. We recommend that you use boat care products from reputable manufacturers and that you follow the directions for use.

We draw your attention to the following things in particulars:

Gel coat

The gel coat above the water line must **not** be cleaned using a high pressure washer. Doing so will cause unnecessary wear, which will be noticeable in time.

Railings and hardware

Metal parts should be waxed with marine wax. Use metal polishing compounds on corrosion spots, followed by a coat of wax.

Canvas canopy

This can be hand washed using a mild detergent - do **not** use washing machine. Then impregnate with a impregnation preparation - i.e. same as used for tent cloth

Exterior teak

This should be rubbed with sandpaper no 80 and treatened with teak oil for external use.

Bottom paint

Follow the directions of the manufacturer. The water line is marked by a dotted line in the gel coat.

Cathiodic corrosion protection

A zink anode is located on the rubber assembly and connected with the engine. The purpose of this is to localize all galvanic corrosion caused by stray current going to ground through the propeller or rudder assembly.

The zinc anode must be inspected and replaced at least once each season,or as needed. If the anode has deteriorated completely, corrosion will begin on the propeller and rudder assemblies.

The anode most **not be covered with primer or bottom paint.**

19. TRIM / LOADING

When stowing loose articles aboard, they should be placed so as to keep the boat in trim, both fore-aft and athwart.
Do not take more passaengers aboard than there are seats.
Do not let passengers sit on the foredeck at high speeds or in rough seas, as this will affect the stability of the boat.

20. SAFETY EQUIPMENT

The safety equipment included aboard will varyaccoring to the requirements of the individual user. We suggest the following as a minimum, however:

1. Aerial flares and parachute flares
2. Flashlight
3. Extra fuel, engine oil, filler hose and funnel
4. Well-stocked toolbox, as well as spare light bulbs, fuses, assorted hose clamps and screws
5. Anchor and chain of the correct size, or a sea anchor, plenty of good quality rope, fenders.
6. Spare impeller for engine cooling system pump, and spare v-belts.
7. Charts and compass
8. Lifejackets for all persons aboard.

NOTE !

Fire, engine stop, or other unforeseen difficult situations occur most often quickly and surprisingly. We thus advise you to keep the safety equipment stored in an easily available place aboard, and that each and everyone know how to use it. The safety equipment should be controlled before each season, or at least once a year.

21. WINTER STORAGE - SPRING MAINTENANCE

In addition to the items discussed in the foregoing sections, use the enclosed checklists for "Winter storage" and "Spring Maintenance":

- As far as at all possible, electronic components should be removed and stored in a dry place.

- Equipment/furnishings that have gotten wet should be taken out and dried.

- Remove/wipe away all water and moisture inside the boat.

- Leave vents and hatches in ventilation settings, but ensure that rain and snow cannot enter the boat.

- Cover the boat and provide the covering with sufficient support to ensure that the boat is not weighted directly with large amounts of ice and snow.

22. WARRANTY / COMPLAINTS

Length of warranty

conforms to applicable law and statutes.

Repairs under the warranty

carried out at manufacturer's expense may not be commenced until approved by the manufacturer or the manufacturer's representative.

Repairs

shall be performed at a repair shop approved by the manufacturer. If no other agreement has been made, the owner is responsible for transporting the boat or equipment to the repair shop.

Defects

- caused by negligent or incorrect use or poor maintenance are not covered by the warranty.

- caused by incorrect or impure fuel ar not covered by the warranty.

- due to normal wear are not covered by the warranty.

Defects in equipment, or those caused by the use of equipment that was not installed by the manufacturer are not covered by this warranty.

Fuses, light bulbs, glow plugs, filters, drive belts and so forth are consumables.

WINTER STORAGE OF ENGINE

For good winter storage, the following steps should be carried out:

1. Inspect and replace zinc anodes if necessary
2. Drain and clean water trap
3. Run engine on fuel/engine oil mix until warm
4. Shift fuel filter cartridge
5. Vent diesel system
6. Drain engine oil and refill up to minimum level
7. Shift engine oil filter
8. Shift gear oil in transmission and stern drive
9. Run a freshwater/antifreeze mixture appropriate for your location and climate through open side of cooling system.
10. Close seacock inlet
11. Check at all draincocks to ensure that antifreeze mixture has circulated throughout the seawater system
12. Close all fuel line stopcocks.
13. Clean seawater filter and drain all water from inlet hose
14. Inspect and replace v-belt(s) if necessary
15. Clean air cleaner filter element or replace if necessary, and seal air intake
16. Seal exhaust pipe
17. Seal transmission air vent
18. Adjust valve clearance
19. Label and disconnect battery cables. Take batteries ashore and charge up
20. Clean all electrical connections, moving parts, starter and generator, and spray on a rust-inhibiting oil, silicone spray or equivalent.
21. Leave engine compartment partially open.

Carrying out these steps will ensure safe storage of the engine through a normal winter season. Longer storage requires repeating of these steps, or a special storage procedure.

These preparations for winter storage are also based on being followed by the spring maintenance procedure. NOTE: The cooling pump impeller must be inspected during spring maintenance.

The engine must not be started or turned over again until it has been made ready.

SPRING ENGINE MAINTENANCE PROCEDURE

This procedure is intended as a follow-up of the winter storage procedure. No spring maintenance is complete unless the winter storage procedure has been performed.

1. Open all draincocks in the engine's cooling system.
2. Inspect and replace impeller if necessary. Refit seawater pump cover.
3. Replace v-belt(s) and tighten
4. Inspect all water hoses
5. Open seacock(s)
6. Remove sealings from air intake, transmission air vent and exhaustpipe
7. Reconnect exhaust hose
8. Top up engine oil to max. level
9. Set batteries in, reconnect cables ensuring correct polarity
10. Check transmission and stern drive oil level
11. Inspect engine wiring and electrical connections
12. Open fuel line stopcocks
13. Drain water trap
14. Vent diesel filters and pump
15. Grease propeller shaft and packing box and inspect packing box tube
16. Check engine alignment
17. Inspect rubber boot on boats with stern drive
18. Start engine and check for leaks in cooling and exhaust systems. Check all functions, instruments, warning lamps and alarms
19. Tighten important bolts, nuts and hose clamps on engine.

IMPORTANT!

This procedure is to be carried out with the boat on the water. If done onland, the engine has not been started and seacock is still closed. This must be opened before starting engine!

Remember to replace bottom plug before launching boat!!!