

# OWNER'S MANUAL

# SWAN 43

This manual is intended to give some general maintenance hints and as a guide to the proper use of the equipment.

## Sections

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DRAWINGS AND MANUALS IN SEPARATE BINDERS

**Note:** The manual has been written to cover the whole series of SWAN 43's. Individual boats may differ in detail from one another and all variations cannot be covered. No attempt is made to cover owner supplied items.

January 1986

## 1. HULL

Appended: Steering gear assembly.

### GLASSFIBRE MAINTENANCE

Glassfibre is not completely maintenance-free. The surface collects dirt and slowly loses its gloss. Regular cleaning and waxing is needed to keep the surface in top condition.

#### Cleaning

Soap and water or a detergent will remove most of the dirt. There are also a number of special glassfibre cleaners available. Gasoline or kerosene will remove oil and tar. If they fail, rubbing compound can be tried.

Harsh abrasive and chemical cleaners are not recommended. Wet and dry sandpaper, 600 grit, is the strongest remedy, and must be followed by polishing with rubbing compound to restore the gloss. Be careful not to sand through the gelcoat surface.

#### Waxing

Wax your boat at least once every year. Wax seals and protects the surface, minimizing the collection of dirt. Use special boat wax, or a silicone-free automotive type.

#### Scratches

Shallow scratches are rather harmless, but if they are deep and expose the glassfibres, the laminate will absorb water by capillary action. This will impair the strength of the laminate, so instant action is needed.

#### Patching

Pre-accelerated gelcoat for patching is delivered with the boat. The bigger can contains gelcoat for the hull, the smaller is for the boot top. The bottle contains catalyst. Gelcoat can be stored about one year, or appreciably longer if kept in a cool place. The amount of catalyst to be added is 1.8 %, which will give a working time of about 25 minutes at an ambient temperature of 20°C (68°F). For measuring catalyst, a graduated cylinder or disposable syringe is convenient. 1.8 ml per 100 g gelcoat makes the right mixture, which equals about 12 drops per ounce. Before work can start, the damage area must be completely dry. Remove dirt and loose gelcoat, and de-wax around the edges with wax solvent. The use of acetone, chloroform, carbon tetrachloride, or methylenechloride is not recommended as they have a detrimental effect on the laminate if applied too liberally. Rub up the surface by sanding and put masking tape around the edges to limit the patch. Add catalyst to a suitable amount of gelcoat and spread the mixture over the damaged area, filling up a little overthickness, as the material shrinks when curing. To get a smooth surface, the repair work can be covered with cellophane and squeegeed down. After about twice the working time mentioned above has elapsed, the patch is cured and can be wet sanded smooth with 600-grit paper, followed by rubbing compound and wax. If your boat has been exposed to the sun a lengthy time, the patch at first may differ in colour, but will fade in after a couple of months.

#### Underwater

To reduce the risk of osmosis or blistering, Nautor has applied two coats of epoxy tar to the GRP surfaces under the water line. It is extremely important that this surface is kept intact, as otherwise water will be able to penetrate into the laminate, and possibly cause problems. Harsh grinding of the antifouling must therefore be avoided. If the epoxy or gelcoat layers have been damaged, they have to be restored as soon as possible. Six layers of epoxy is recommended where the gelcoat is missing.



### Antifouling

There are basically two types of antifouling - soft, which can be scrubbed away, and hard, which tends to build up until starting to peel off. The hard type is recommended for boats spending more than a few hours ashore before being launched, or which are occasionally out of the water. Antifouling with a stronger effect is needed in warm waters. Remember that antifouling contains toxic chemicals which can harm eyes and lungs. Never dry grind old antifouling as that will cause dust to fly around. Wear appropriate goggles and a respirator even when wet scrubbing or sanding. Never use paint removers on glassfibre surfaces, except the type specifically formulated for this substrate. Antifouling containing copper, lead or mercury may accelerate the deterioration of the propeller shaft zinc anode. The best way to remove antifouling is high-pressure water spray.

### Keel

Often, on hauling, it will be noticed that along the joint between the hull and the lead keel there is a crack in the paint. This is caused by different thermal expansion and contraction in the materials and should cause no problems. If the crack opens after a grounding, it is necessary to check the tension in the keel bolts.

Recommended torques are:

|                           |
|---------------------------|
| M20 - 150 Nm (110 lbs ft) |
| M24 - 260 Nm (190 lbs ft) |
| M30 - 510 Nm (380 lbs ft) |

### Steering gear

Steering cables should be hand tight. The adjusting screws are located on each side of the quadrant. Check the cables regularly for wear. If there are any broken strands, change cables at the earliest opportunity.

The steering gear has roller bearings which should be kept well greased. Molycote DX or Molycote 44 Fluid is recommended. Grease nipples are installed on all bearings, except for steering sheaves, which are permanently lubricated. Remember that the emergency tiller, stowed under the helmsman's seat, should always be easily available. Practice its installation, which can save very vital time should it ever be required.

### Flotation reference marks

At bow and stern there are reference marks twelve inches (305 mm) above datum water line. With the aid of these the exact flotation can be determined. Note: Normal flotation is heavy of the DWL - this is provided as a reference only.

## OPTIONALS

### Autopilot

The drive unit is located in the lazarette and is connected to the quadrant by sprocket and chain. The remote compass is located in the aft cabin SB locker, and the same precautions should be taken as for the steering compass, see section 7. The drive unit has fuses inside the cover, see Manufacturer's Handbook for instructions. On the main switchboard there is a trip circuit switch controlling the power supply.

## 2. DECK

### Appended:

Deck arrangement  
Deck optional equipment  
Single laminate areas  
Winch handbook  
Halyard arrangement

### Glassfibre deck

Maintenance directions for the glassfibre decks are the same as those given in the hull section (Section 1). The non-slip surfaces are painted with a mixture of gelcoat and grit.

### Winches

Directions for use and servicing is given in Manufacturer's Handbook. The winches and cleats are fastened through deck to threaded aluminium back-up plates.

### Halyard arrangement

The layout of the halyard exits on the mast requires that the halyards and lifts are arranged as shown on the appended drawing. A recommendation for the reefing lines is included.

### Blocks

Occasionally rinse with fresh water to prevent sheaves from seizing.

## OPTIONALS

### Teak deck

The teak decking is glued with epoxy when laid. The edges are screwed to the fibreglass deck and the screwholes are then plugged. All seams are payed with Polysulfide mastic. To maintain the original appearance of the deck, regular cleaning and treatment with a preservative is necessary.

If the grey, weathered look is preferred, allow the deck to weather and then clean, as necessary, with soap and water. High pressure water spray should be used with great care. Do not hold the spray nozzle too close to the teak, as this could remove parts of the wood.

Before taking fuel, flush the teak deck near the filler with water. This will prevent overflowing fuel from leaving marks on the teak.

Note: Do not use bronze wool in cleaning teak as it will react with the aluminium toe rails and sheet tracks.

### WARNING

It has been reported that in hot climates, the use of teak conditioners containing mineral turpentine may cause a softening of the deck seam mastic, and finally result in a complete deterioration of the material. Extremely hot sun appears to be a prerequisite.

As the contents of such conditioners are not always fully declared, great care has to be taken when choosing the product, and it would be advisable to try it out on a small spot first. To be safe, avoid the use of these treatments.

Anchor windlass Lofrans

If the windlass is overloaded, a trip circuit switch in the main fuse box (pos. 45 on the installation drawing) will cut off the power, and needs to be reset.

Note: The windlass uses much battery power, and should be used judiciously. It is recommended that the engine be run simultaneously, thereby preventing too much battery drain. The oil level inside the gearbox can be checked through the small sight glass on the forward face. The oil level must always be visible. Use BP Hypogear or equivalent oil of SAE 50 or 60 viscosity.



### 3. INTERIOR

Appended  
Cabin arrangement plan

#### General

Take care of the interior, keep the boat well ventilated at all times.

All teak surfaces are varnished with several coats of Sadolux varnish. If any damage should occur, sand smooth with light sandpaper and apply Sadolux varnish or equivalent. Sadolux varnish is available from Nautor.

The satin finish is restored by polishing with a mixture of equal parts of white spirit and sewing machine oil.

#### Floorboards

All floorboards are treated with Pinotex preservative, which can be obtained from Nautor. If a floorboard should stick, plane the edges with a 10° under bevel to restore easy fit.

#### Leeboards, canvas

To install leeboards, the edge under the mattress should be stretched as tightly as possible between the eyes provided. When needed, tie one end of the upper edge through the eye at the foot of the bunk, then tie in the head end, again as tightly as possible, after entering the bunk.

When not in use, the canvas should be stowed flat under the mattress.

#### Main cabin settees

When used for sleeping, turn the backrest cushions upside down for getting maximum beam.

#### Head door

Should the door inadvertently become locked with no-one inside, it can be unlocked by pushing an ice pick or similar device into the hole in the center of the knob.

#### Overhead covering

The overhead covering may be removed if necessary. Start at a panel corner, and pull it down gently, until the attachment system gradually releases the panel. The teak strips are glued in place and need not be removed.

#### 4. PROPULSION MACHINERY

The engine handbook contains detailed instructions for running and servicing as well as a technical description of the engine. The owner is advised to read this book carefully.

##### Appended:

- Engine installation
- Sounding table
- Folding propeller instruction
- Propeller shaft drawing
- Speed, consumption, range diagram

##### Engine controls:

###### In cockpit:

- ON/OFF switch for engine controls
- Buzzer and warning light for low oil pressure/high coolant or exhaust temperature.
- Warning light for high level in fuel line water separator
- Tachometer with engine hour meter
- Coolant temperature gauge
- Oil pressure gauge
- Fuel tank level gauge
- Charging control lamps
- Starting button
- Stopping button
- Engine control lever with combined throttle and gear shift (For starting up, the gear shift is disengaged by pulling out the lever into "neutral gear position" which allows changing engine speed without engaging propeller).

##### Check before starting

- Fuel tank level
- Cooling water intake seacock open (under floorboards port side of the engine)
- Cooling water strainer not choked up (to be cleaned every 100 hours of running or when engine temperature shows a tendency to rise). Located near seacock. Check for air pockets after rough weather sailing and bleed.
- Engine lubricating oil level
- Reduction gear oil level
- No water in fuel line water separator (under port settee in the main cabin, warning light in cockpit)
- Fuel shut off valve open (on top of tank)
- Fuel return valve open (same as above)
- Shaft lock pin not engaged

##### Starting

- Turn on main switch (under navigator's seat), turn on engine control switch on main switchboard.
- Pull out the engine control lever in neutral gear (i.e. vertical), then advance throttle to starting position, i.e. half open.
- Turn on engine control cockpit switch. Charging control and oil pressure lamps will light up, and audible alarm sound.
- Push start button, (not more than 10 ... 15 secs continuously) with throttle half open.
- The engine has a fully automatic cold start device.

### Important

If the engine for some reason does not start, the silencer will collect all the water pushed into the exhaust by the cooling water pump. After three or four attempts, the silencer should be drained to prevent the collected water from flowing back into the cylinders. The silencer has a drain cock for this purpose.

### Running

- After engine has started, set revolutions to idling, about 750 rpm.
- Check oil pressure, normally 2 ... 4 kp/cm<sup>2</sup>.
- Check that charging control lamps switch off.
- With control lever in neutral, push in the lever into gear shift position. Now throttle and gear shift are coupled together.

CAUTION - Engine should not be run, either for power or charging batteries, at excessive heel angles. When running at angles of more than 20°, temperature and oil pressure should be watched carefully. Do not run engine continuously at full throttle. Full throttle operation should be for emergency use only. For normal use back off throttle slightly, 200 r/min below maximum attainable engine speed.

### Slow running and idling

Never use less than 1000 rpm when the gear is engaged. If run at lower rpms, the engine is almost stalled. If the engine has a tendency to stop when idling with the gear disengaged, try to switch off the alternators which can load the engine considerably. (See section 6). The idling rpm cannot be raised too much, as the gear shift will then be hard to move.

### Stopping

Slow engine to idling speed.

When sailing with the shaft lock not engaged, shift into forward gear. This will aid the standard propeller to fold, and is necessary for the optional Max-Prop to feather.

When charging batteries, (or in harbour) the gear must not be engaged. Push stopping button until engine is stopped. Push off engine control switch.

### Lubricating oil

On the engine is a label stating the type and make of engine and reduction gear oil filled at the yard.

### Lubricating oil filters

Spin-on element canisters are being used. Use only genuine replacement canisters of the correct type. For Volvo spare part number see section 10 Spares.

### Folding propeller operation

The folding propeller will give good service as long as it is used with reasonable care. The following points should be kept in mind.

1. Avoid shifting to "forward" at more than idle engine speed. Excessively rapid forward engagement can damage the propeller. Be especially careful after going astern and always avoid excessive speeds when going astern.

Note: If propeller fails to open on shifting into forward, shift to reverse and back to forward and it should open.



2. When starting to sail, after running under power, to insure propeller folding correctly, momentary use of forward gear when stopping the engine will help. With the gear in neutral the normal spinning of the propeller can otherwise keep blades open and shaft spinning after shutting down the engine. Engaging the gear to stop shaft rotation should cause a spinning propeller to fold.
3. If the propeller persists in spinning when the gear is put into neutral under sail, this indicates that there is some propeller damage preventing the normal folding of the propeller.

#### Shafting alignment

A shaft log with one bearing is used, with the sterntube gland flexibly supported by reinforced rubber hose. The gland can absorb normal engine movement on the flexible mountings. The rubber bearing is in the bracket aft.

It is important that shaft alignment is checked annually, with the boat in the water. Taking into account the face run-out on the gearbox and propeller shaft flanges, the total misalignment should not be greater than 0.0635 mm (0.0025 ins).

Vibration in the shaft can be caused by the shaft being out of alignment, incorrectly adjusted rubber mounts, unbalance in the propeller after hitting some floating object, or in bad cases also by a bent shaft. Carefully investigate the reason, and rectify at the first opportunity.

Note: If possible, avoid keeping the boat in quiescent contaminated water. The low oxygen content in such water in combination with dirt accumulated on the shaft can cause corrosion even on the stainless material.

It is recommended that the tightness and locking of all nuts on the coupling flanges, and on the engine mounts, is checked a few times each season.

#### Shaft lock

To permit use of the engine to charge the batteries while racing, there is a shearable shaft lock pin provided. This is inserted to engage the reduction gear coupling in one of two positions 180° apart, which will lock the propeller with the blades in the vertical position. While locked, the engine can be run in neutral. An accidental gear shift will cause no damage other than shearing this pin. Extra pins are provided in case this should occur.

Note: With the engine stopped, engaging the gear will lock the shaft.

#### Shaft bearing

The shaft has one replaceable Cutless Rubber Bearing (1 1/4" x 1 3/4" x 5"). This bearing should be checked whenever the boat is hauled. If worn so that there is visible clearance around the shaft, the bearing should be replaced. Locking screws for the bearing are on SB side of the strut.

Note: Take care to flush the rubber bearing with fresh water after hauling the boat. If the bearing is allowed to dry out with saltwater inside, it might freeze up.

#### Cathodic protection

There is a zinc anode on the propeller shaft right in front of the shaft strut which should be checked visually whenever the boat is hauled or at least 2 or 3 times/season. If this is more than 50 % eaten away it should be replaced.

Antifouling containing copper, lead or mercury may accelerate zinc deterioration. If the boat is laid up in the water, it is recommended to hang a sacrificial anode over the side, connecting its cable to the main shroud, or head- or backstay, which are grounded. Do not use insulated stays, used as antennas, for this purpose.

The shaft zinc protects the propeller only. The seacocks are not bonded to the zinc, and the engine electrical system is of the insulated return type, meaning that the negative side is not connected to the engine block. Quick deterioration of the zinc indicates a possible leak in the electrical system. Installation of additional electronics, which have the negative side connected to ground may be another reason.

A third possibility is that the boat is kept hooked up to shore power in a marina where other boats do not have their anodes in order. Through the common ground line these boats are able to consume your zinc. It is therefore not advisable to keep the shore power connected continuously.

#### Fuel system

The fuel tanks are located behind the main cabin settees and filled through a deck plate marked "FUEL". The fuel supply can be checked by putting the sounding rod, stowed as shown on the sounding table, through a small hole, covered by a screw cap on the tank. Refer to the sounding table for conversion. The cockpit gauge gives a rough indication of the fuel level.

The fuel system has shut-off valves on the tanks and a water separator under the port side settee in the main cabin. A 2-way selector valve is mounted on the return line, shut-off valves are mounted on the feed line. The fuel tank vent outlets are on the Dorade box forward of mast.

**Note:** The fuel line water separator has a warning light on the engine panel in the cockpit. This warning light indicates a high level of water in the separator which then should be drained at the earliest opportunity. A drain screw is provided under the separator. Keep a small cup ready when opening the drain. **WATER IN THE FUEL WILL CAUSE SEVERE DAMAGE IF IT REACHES THE ENGINE FUEL INJECTION PUMP.**

#### Speed, consumption, range

With the aid of this diagram the above variables can be related to engine rpm. Note the quick drop in consumption when rpms are kept down.

#### Propeller shaft stuffing box

**CAUTION: TIGHTEN BY HAND ONLY**

When the shaft is first operated by the boat engine, tighten packing gland until it almost stops leaking (about one drop per second) but do not stop leak entirely. After the shaft has run for a few hours it is permissible to further take up (by hand only) the packing gland to reduce leakage to a minimum. For maximum service life from the packing and to avoid the possibility of scoring the shaft, always allow the packing to leak just a slight amount. If the stuffing box feels hot when running, it is overtightened and should be loosened slightly to allow lubrication. Be sure to install the locking cotter pin after adjusting.



### Cooling system

The engine has thermostat-controlled fresh water cooling with a heat exchanger for the cooling water. A cap on the engine top is provided for checking the fresh water level. The raw water intake seacock is located under the floorboards to port of the engine and has a strainer nearby. A raw water by-pass is run to the refrigeration condenser. The raw water pump on the engine pushes the water through the heat exchanger and discharges the raw water through a vented loop into the exhaust elbow. The loop will prevent the exhaust from filling with water in case of a leaking pump. The vent pipe discharges through the topside to P. At higher engine revolutions a little water should be pushed out through the vent, indicating that the line is open.

### Exhaust system

This is of the water lock type and consists of a rubber silencer to which both exhaust gases and the outgoing cooling water are led. The silencer is filled partly with cooling water to a level pipe, through which the water is conveyed by exhaust gas pressure to discharge at the transom. When starting difficulties are experienced (see under Starting) the drain tap on the silencer should be opened so the water collected there can get out, otherwise it might intrude into the engine after prolonged starting attempts.

Note: When sailing in storm conditions, it is recommended that the silencer drain tap be opened, so that water forced into the exhaust can drain into the bilge.

The exhaust silencer has a temperature alarm connected to the engine fault system, indicating that the supply of cooling water is interrupted.

Note: The exhaust system must not be run dry, as the rubber parts very soon will be destroyed, and could even catch fire with disastrous results.

## OPTIONALS

### Feathering propeller MAX-PROP

The feathering propeller will give good service as long as it is used with reasonable care. The following points should be kept in mind.

1. Avoid shifting between "forward" and "reverse" at more than idle engine speed. Excessively rapid gear shift can damage the propeller mechanism.
2. The propeller needs some time to reverse the blades, and will not respond instantly to a gear shift. Shift at idling rpms, and check that the propeller drives in the correct direction before increasing engine revs.
3. A too rapid gear shift immediately followed by full power may prevent the blades from reversing properly, and cause the propeller to drive in the OPPOSITE direction, i.e. the same as before the gear shift. The consequences may be catastrophic.
4. The blades can feather to sailing position only from the forward position, and not from reverse. Therefore, when stopping the engine, gear shift lever must be in forward. Whenever the boat is out of the water, make sure that the blade mechanism moves freely. Otherwise the water stream will not be able to turn the blades to the desired fore and aft sailing position.

The feathering propeller has a tendency to collect grass on the blades.



## 5. PLUMBING

### Appended:

Plumbing diagram  
Installation drawing  
Toilet manual  
Cooker manual  
Refrigeration manual  
Sounding table

### Seacocks

Bronze seacocks are installed on all through-hull openings below waterline.

The seacock is open when the handle is pointing away from the hose, and closed with the handle touching the hose from either side.

It should be noted that insurance does not cover damage caused by leaks, if the water entered through an open seacock. A burst sea water hose could, as an example, cause this sort of damage.

It is therefore advisable to always close the seacocks when leaving the boat unattended. An additional benefit is that there is less tendency for the seacocks to "freeze up" if they are moved regularly.

### Sounding table

The tank positions and capacities are shown on this table (capacity is related to sounding measurement by the table). There are two marked sounding rods located as shown, one for water and one for fuel. The tank levels can be checked by inserting the sounding rod through the small screw cap on the tank inspection plate.

### Fresh water system

In warmer climates care must be taken that the water carried in the tanks is potable. Carry your own water hose, or flush the shore supply thoroughly before filling. Don't fill the tanks more than necessary. At the end of a cruise, or before refilling, drain the tanks completely.

Water is filled through a deck plate marked WATER on SB side. The filler line terminates at the valve chest, located under the floorboards adjacent to the main cabin table. The chest has a valve for each tank. These valves must be open when taking water. When water flows out through a tank vent pipe into the bilge sump near the valve chest this indicates that the tank is full and its valve can be closed. There is also a vacuum valve on each vent line loop. It is recommended that water is taken from one tank at a time, keeping the other valves closed. If more than one valve is open, water will drain from the higher tank into the lower when the boat heels, and results in water overflowing through the vent pipe. The wash basins and the galley sinks are connected to the fresh water system.

### Galley and wash basin mixing faucets

These are of the one-hand type, and are opened by lifting the lever. Turning the lever to the left gives warmer water, and vice versa.

To use the shower, first open faucet and adjust water temperature to desired level. Then press the change-over button on the shower head.

### Pressure water system

An electrical pump is located under the main cabin port settee and has a gauge nearby. A pressure vessel is located in the locker under the galley sinks. Inside the pressure vessel is an air volume, which should have a pressure of 1 bar with no pressure in the water system. With the water system working, the gauge should display between 1.2 and 1.5 bar. Keep the gauge shut off except when checking pressures. The system is controlled by a switch marked WATER PRESS on the main switchboard. With the pressure system off, the foot pumps can be used, but remember to open the faucet valve first, otherwise no water will come out.

### Water heater 20 l

Located under aft cabin berth.

The water is heated by means of engine cooling water, or alternatively by 110 or 220V AC resistor element (provided shore power available).

Note: Before turning on shore power to the heater, first make sure that the system is filled with water. This is checked by opening the hot water tap, letting a little water out.

The water temperature is controlled by a thermostat with a setting knob under the cover at the power cable connection where also a reset button for the overheating protection is located. The protection will cut off the power if there is no water.

### Sea water system

Sea water is taken from a seacock with strainer under the galley floorboards. A valve chest serving galley, aft head and engine is located nearby.

### Bilge and drainage system

There are two hand operated bilge pumps, one outside in the cockpit, one inside under the port settee in main saloon. The screened intakes are located under the table. The galley sinks drain through a seacock under the sinks.

Note: The plastic shut-off valve under the sinks must always be kept closed at sea, as the sinks otherwise might overflow with seawater when the boat heels to port. It is recommended to always keep this valve shut.

For the heeled condition a hand pump for the sinks is provided, outlet above the waterline.

The refrigerator and icebox drains are also connected to this hand pump. Their shut-off valves are located under the sinks. When the fridge or the icebox are to be emptied by the sink hand pump, the plugs for the sink drain must be put in their places, making an airtight fit, otherwise the pump will only suck air.

Be sure to close the box drain valves after pumping out the defrosted water, otherwise sink water might run into the ice box.

The wash basin and shower pan drain to a sump tank integrated into the molded floorliner.

The sump tanks are emptied with a hand pump outboard to an outlet above the waterline.

Note: Each time the sump tank pumps are used, the pumping must go on until the pump sucks air. This will break the water siphon in the outlet line, and prevent sea water from flowing back and flooding the tank.

### Toilets

Instructions for the toilet are given in the Toilet manual. Sea water is used for flushing. The outlet sea cock for the toilet is outboard under the wash basin.

The toilet is electrically operated and flushes for a predetermined period. The time can be adjusted with a screw behind the switch. 30 to 45 sec flushing is recommended. The electric pump is located under the wash basin. If the electric pump fails, it can be replaced with a hand pump, supplied with the boat. The hand pump fits on the same plate under the wash basin as the electric pump.

Note: The seat and lid must be closed before the toilet's flushing button is pushed. With the lid open, no flushing water is drawn in.



#### Gas stove

Use and maintenance of the stove is explained in the Cooker Manual. Space is provided for two 6 kg gas bottles in the port side cockpit stowage locker. Nearby there is a shut-off valve remotely controlled from the galley. This valve should be kept closed except when cooking. This will prevent gas from escaping into the boat even if the line develops a leak. A hand operated leak detector is mounted adjacent to the gas bottles.

It is recommended to extinguish the cooker flame by shutting off the remotely controlled valve, thereby leaving no gas in the pipe run. Check the gas line for tightness every month, and after rough passages. An easy method is to apply soap water with a brush. Never check the gas line with an open flame! Never leave a lighted stove unattended!

#### Ventilation

The cabins have natural ventilation.

Fresh air is provided through Dorade vents. The cowls should be trimmed to face the wind except in heavy weather when they should be turned away from the wind, or if necessary, replaced by the tight caps.

#### Refrigerator unit Frigoboat

The compressor is belted off the engine. The belt drive has a magnetic clutch operated by the fridge thermostat.

The condenser is located under main cabin port settee and uses a cooling water by-pass from the engine raw water system.

A hold-over plate is installed in the fridge. To cool down the refrigerator, the engine has to be started, and the main panel switch marked ENG.DRIVEN COOLING COMPRESSOR put in ON-position (up). The adjacent green signal light marked ENG.DRIVEN COMPRESSOR ON will then light up. If the temperature in the refrigerator is higher than the thermostat setting, the compressor will start and the yellow signal light ENG.DRIVEN COMPRESSOR RUN lights up, indicating that the magnetic clutch is engaged. When the hold-over plate has been cooled down enough, the thermostat will disconnect the magnetic clutch. This is indicated by the yellow signal light switching off. After switching off the main panel switch (and the green light), the engine can be stopped.

A red light marked FAULT indicates that the refrigerant pressure is outside the preset limits.

#### OPTIONALS

#### Engine powered Frigoboat refrigerator and freezer unit

With this installation it is possible to direct the cooling medium either to the refrigerator or the freezer, or to both. In order to run the system, the engine has to be started, and the DC panel switch ENG. DRIVEN COOLING COMPRESSOR put in ON-position, which will cause the green signal light adjacent to the switch to light up.

To run the refrigerator, put the DC panel switch REFRIGERATOR in ON-position. If the temperature in the refrigerator is higher than the thermostat setting, a yellow signal light, REFR.MGNT VALVE OPEN, will light up, and the compressor start. When the yellow light turns off, the hold-over plate has been cooled down enough.

To run the freezer, put the DC panel switch FREEZER BOX in ON-position. A yellow light, FREEZER MGNT VALVE OPEN, indicates that the compressor is running. When the yellow light turns off, the hold-over plate has been cooled down enough.

The refrigerator or freezer can be defrosted individually by keeping the REFRIGERATOR or FREEZER BOX switch in OFF-position.



#### Engine and shore powered Frigoboat refrigerator and freezer unit

There are two separate compressors, which can be run individually or together. The engine-driven compressor has a considerably larger capacity. When loading non-frozen food into the freezer, it is recommended that this compressor be used. The shortest cooling time is achieved by running both compressors together.

The engine driven system works as described in the paragraph above.

The shore powered compressor has a switch on the AC panel, marked REFR. When this switch is put in ON-position, a green signal light, AC COMPR. ON, lights up. The refrigerator and freezer can then be controlled individually as described for the engine driven system.

#### Air heater

The Eberspächer waterborne heater is installed in the aft peak with the exhaust through the SB side of the transom.

The heater is started from the main switchboard. The boat has two hot air blowers i.e. heat exchangers with 3-speed fans. One is located under the double berth in the aft cabin, the other one in the fo'c'sle under the pipe berth. A switch for the 3-speed fan is located nearby. The fans are thermostat-controlled. The thermostats are placed in the aft cabin and saloon. There is a warning light on the switchboard indicating that the heater is on.

The heater uses fuel from the port fuel tank.

Check that the batteries are properly charged before starting the heater (see section 6 Electrical).

**Note:** Do not turn off the main switch immediately after turning off the heater. The heater has an automatic cooling down sequence, which needs power for a few minutes.

#### Holding tank 65 l

The sewage from the toilet can, depending on the position of the two-way valve in the head, be pumped either overboard or into a holding tank. The holding tank is emptied overboard by hand pump, or alternatively by a deck suction line.

## 6. ELECTRICAL

Appended:  
Service wiring diagram  
Engine wiring diagram

There are two independent 12 V DC systems - the service circuit for lighting, instruments, pumps, etc. and the engine circuit for starting and charging.

### Main switch

This cuts out all DC in the boat (except electric bilge pump and "leading light") and should be turned off when the boat is left unattended, or when making repairs on the electrical system. The main switch is located in the navigator's seat.

Warning! Never turn the main switch off with the engine or heater running as this could cause serious damage!

### Dials on main switchboard

To the right is the engine starting and service battery Ammeter, indicating the amount of charging by turning the toggle switch marked SERVICE AND START A-METER into the appropriate position. To the right is a Volt-meter showing service or starting battery voltage by turning the switch marked BAT. TEST in the appropriate position.

### Service switches

These are of the trip-free circuit type, which will switch off automatically if overloaded. If, when a switch is pushed into ON-position it immediately drops back down to OFF-position, this means that there is a fault causing excessive current. The fault must be found and remedied before the switch can be used.

### Fuses

On the switchboard there are a number of fuses for such electric equipment that have own built-in switches. To check if a fuse has blown, unscrew the cap and examine the fuse wire. If in doubt, change to a new fuse.

The main fuses are located in the forward cabin lower locker SB side opposite to the service batteries.

### Batteries

The service batteries are in a vented GRP box under the saloon sofa front wing. Four 6V 240 Ah are connected to deliver 12V 480 Ah. The starting battery 12V 93 Ah is located in the navigator's seat in a vented box.

Check the state of charge at least once every month with a hydrometer. The specific gravity of the acid and the open circuit voltage indicates the battery condition as follows:

| <u>Specific gravity<br/>of the acid</u> | <u>Open circuit<br/>battery voltage</u> | <u>Battery status</u> |
|---|---|-----------------------|
| 1.28                                    | 12.7 V                                  | 100 % charge          |
| 1.26                                    | 12.6 V                                  | 85 %                  |
| 1.24                                    | 12.5 V                                  | 70 %                  |
| 1.22                                    | 12.4 V                                  | 55 %                  |
| 1.20                                    | 12.2 V                                  | 40 %                  |
| 1.18                                    | 12.1 V                                  | 25 %                  |
| 1.16                                    | 12.0 V                                  | 10 %                  |

Ambient temperature 20°C (68°F) is assumed.



In temperatures other than 20°C the specific gravity of the acid has to be corrected, as the specific gravity drops 0.0007 units for each degree rise in temperature. At 30°C (86°F) for example, a battery with sp.gr. 1.193 has a 40 % status.

The acid level for a fully loaded battery should be 3...8 mm over the plates. If too low, add distilled water.

Note: Never add water to a discharged battery, because the process of charging may cause an overflow, which will weaken the acid concentration. This results in an appreciably shorter battery life.

Never use open fire nearby when the batteries are checked. Never move acid from one cell to another. Before the cell caps are screwed down, check that the air holes are open.

Check and grease the battery cable connections with vaseline monthly.

Check that the ventilation pipes from the battery boxes are properly connected.

Important! If the batteries are removed, make sure that the main switch is turned off, and that the cables are properly marked before they are disconnected. Never disconnect the batteries with the engine running, as that could burn the alternator.

Note: Electrical parts and salt water do not get along well, so make sure that all vulnerable electrical parts are sprayed often with preservatives.

#### Battery charging

Battery voltage should be checked regularly. If the open-circuit voltage in either battery is below 12.2 volts, charging is necessary. One to three hours charging per day is recommended, depending on usage. Two 50 Amp engine alternators charge the service and the starting batteries. At engine revolutions over 17 rps (1000 rpm), both Ammeters should display positive charging, recommended charging rpm is 27 rps (1600 rpm).

The charging current reaches its maximum immediately after starting, and then gradually decreases as the batteries become charged.

If the Ammeters do not display any charging after starting, the vee-belt drives for the alternators must be checked for correct tension. The tension should be checked after the first 5 hours of engine running, and after that every 50 hours.

#### Battery output

By definition, battery capacity is the output during 20 hours of constant discharging. The service batteries can therefore produce  $480/20 = 24$  Amperes for 20 hours.

It has to be noted that because of increasing internal resistance, the battery output is considerably reduced if higher Amperages are required.

A 100 Amp load would discharge the battery in about 3.2 hours, and a 200 Amp load in just one hour. In the first instance battery output is reduced to 67 %, in the second to only 44 % of the 20 hour rating.

#### Navigation lights

Navigation lights are constantly exposed to the weather and must be cared for. At the beginning of the season take the bulbs out, clean the contacts and spray with a cleaner-preservative (such as WD-40 or CRC 6-66). This treatment should be repeated periodically (especially after rough weather or hard rain) and again at lay-up time.



## OPTIONALS

### Shore power

Wiring diagram appended.

This is an independent electrical circuit, including an additional AC switchboard with polarity alarm, main switch, fuses, outlets, and 15 m connection cable with plug-in on the boat. The fuses are located in the aft head locker.

Important! Make sure that the shore voltage matches with the boat installation, 110 and 220V must not be mixed up.

To plug in the cable to the boat, push hard and simultaneously turn clockwise until a stop is felt. Then tighten the screw ring.

### WARNING:

To minimize shock and fire hazards:

- Turn off the boat's shore connection switch before connecting or disconnecting shore cable.
- Connect shore power cable at the boat first.
- If the polarity alarm - a red light on the AC switchboard - lights up when the land end of the cable is connected, immediately disconnect cable and have the fault corrected by a qualified electrician.
- Disconnect shore power cable at shore outlet first.

Shore power can be used for the following optionals:

- AC outlets
- Battery charger
- Water heater
- AC refrigeration unit

### Battery charger

This is located in the lazarette. Make sure there is enough free air around the charger, as it needs good ventilation when working. Check that the DC main switch is ON before the AC panel switch marked BATTERY CHARGER is turned on. The service Ammeter should then display positive charging. The starting battery cannot be charged with this charger.

Note: If there is a heavy DC load the Ammeter might show discharging, because it indicates the difference between charging and discharging current. Only with no consumers switched on does the Ammeter display the actual output from the charger.

### Water heater

Before switching on the heater, proceed as described in the Plumbing section. The heater consumes 1000 W.

## 7. INSTRUMENTATION

Appended  
Compass instruction  
Clock instruction

All navigation instrumentation except the clock and compass is optional. Therefore, only a few general hints are given, and the owner is advised to consult the manufacturer's detailed instructions, which are worthwhile reading carefully.

### SUUNTO Compass

Keep portable radios and cameras with exposure meters away from the compass because they are strongly magnetic. Also wrist watches and spectacle frames can divert the compass. Maintain exact alignment of compass so that when sighting across it the fore and aft lubber lines are exactly alongships. The compass card is balanced for the equator.

### Quartz Clock

The clock is powered with an internal dry cell. To change the battery or set the clock, remove the housing from the bulkhead by turning it anticlockwise. Gently pull out the small lid on the back and adjust on the black wheel. The clock has an alarm which is controlled by the small knob on the right side of the housing, on the left side is a wheel for setting the alarm.

## OPTIONALS

### Log

The transducer housing is located as shown on the docking plan. When not in use, the transducer should be retracted to avoid damage from floating objects.

Do not force a B & G transducer down into working position. There is an alignment slot and if the transducer will not go down easily it should be turned until it does.

The transducer is cleaned from weed etc. by pulling it in/pushing it out a few times. This procedure will automatically cut off any weed on the propeller blades.

Note: Calibration instructions are given in operation manuals.

### Echo sounder

The transducer housings are located as shown on the docking plan. Normally there is no maintenance except for the winter overhaul.

### Navigation instruments

On the main panel there is a fuse for all instruments. The lighting for the compass and repeaters are on the switch marked COMPASS LT, INSTR LT.

Important! On B & G instruments there is a desiccator plug which should be checked once every month. Normal colour is blue; if it has turned red, proceed as per manufacturer's instructions. If there is moisture condensing inside the repeaters, also see the instructions.

For the connection of instrument mast wiring, see section 8, Stepping the mast.

### Radio telephone, direction finders etc.

The aerial and earth connections should be checked a couple of times every season for possible corrosion and looseness. Faults on these points may cause a severe reduction in performance. Especially troublesome are all plugs and connections to isolated stays. Corroded surfaces should be thoroughly cleaned, and then sprayed with a contact-cleaner. Let the cleaner work for at least half an hour, wipe off the surfaces carefully, and apply a new layer of cleaner before assembling.



## 8. RIG AND BOAT PREPARATION

Appended  
Sail plan  
Mast wedging drawing  
Slab reefing drawing  
Hydraulic force diagram

### Spars

The spars are anodized aluminium extrusions. They should be washed and waxed as necessary to preserve their appearance. If the spars get scratched, clean the scratches and cover them with metal laquer or wax.

### Stepping the mast

The weight of the mast, including rigging, is about 350 kgs. When inserting the mast heel through the deck opening, be careful not to damage the cables emerging from the mast. Be sure to clear the cables under the mast when it goes onto the step. A multi-pin connection is installed under the floorboards to port of the mast.

### Mast wedging

The mast must be held securely at the deck, and this is achieved with the rubber wedges shown. The first wedge is easy to slip into position, but for the second a strong tackle is needed. The end result should be that the wedges are under considerable pressure. Then the rubber boot should be tightened around the mast and the collar to stop leakage, and protected from the sun with the canvas collar.

### Tie rod

A tie rod is installed forward of the mast to resist the upward load from the halyards.

### Standing rigging

Navtec rod and fittings are used for the standing rigging. Solid rod has less elastic stretch than wire, and can accept higher transient loadings. Consequently tuning is more permanent. When the mast is unstepped, the rods should be handled very carefully, bends, scratches, and kinks must be avoided by all means. At each spreader end there is a fitting which positively locks the spreader tip in position on the rod.

### Straightening of rod:

Any bend where the inside radius is greater than 6 rod diameters can be straightened safely. Sharper bends down to 3 rod diameters can also be straightened provided there are no gashes or dents made by hard objects.

First, unbend the kink a little at a time feeding the rod into a vise as it is straightened.

Then, overbend the kink so it is opposite to what it was, but bend only slightly, the total angle should be 5 to 7 degrees. Next, do the final straightening in the direction of the original bend.

### Shroud tension

The mast and the chainplates have been designed to take some pretension in the rig. As a general rule the rig should be set up so that the leeward rigging is tight up to fifteen degrees of heel. To achieve this it is easiest to adjust the shrouds in a heeled condition, either when sailing, or heeled with a halyard at the dock.

It is advisable to start with the mast straight athwartships and centered in the boat. Apply the recommended maximum load to the backstay (see Section 8, page 3). With the boat heeled over, tighten the leeward rigging screws to make the shrouds just tight, counting the number of turns. Then unscrew again exactly half the number of counted turns, and jot down this halved number. Heel the boat to the other side, and turn the recorded number of turns also here. If there is any slack left, turn half the number of slack-removing turns, and repeat on the other side.

Note that leaving the rigging screws at the full number of achievable turns when heeled for the first time, might pull the mast so far over to this side that it is not possible to center it any more.

#### Mast bend

Mast bend should be limited to about one mast diameter. This recommendation should be conveyed to the sailmaker making the mainsail. See also under "Hydraulics".

#### Halyards

A vital item in preparation of the rig is to ensure that the halyards are adequately marked since the snap shackle can jam at the masthead if the halyard is over tightened.

#### Runners and babystay

The runners are supplied as preventers to stabilise the mast. Do not overtension the runners when they are used as preventers only.

Except in light flat water conditions the babystay is always necessary. In choppy conditions and when shy reaching with a spinnaker up it is particularly important to have it properly set up.

#### Sails

Large advances are continuously being made in sailmaking and it is vital to maintain a close communication with your sailmaker who can advise on the techniques for getting optimum performance.

#### Longitudinal trim

In light airs the boat should be trimmed with the weight well forward. As the wind increases the crew weight should be moved progressively aft so that in heavy running the crew weight should be as far aft as possible on the stern of the boat.

#### Underwater

The keel is a laminar flow section which depends for its efficiency on being smooth on its leading edge. It is therefore worthwhile ensuring that the front half of the keel is sanded and polished as finely as possible. The same applies to the rudder. While the boat is out of the water check that the position of the propeller in the up and down situation is clearly marked inside the boat on the coupling so that when racing this position may be checked before the start.

#### Spinnaker aft guy

An aft guy taken straight to the footblock will bend the lifeline stanchions. The aft guy should therefore be led through a block attached to the side deck amidships.

#### Reefing

It is recommended that reefing be practiced in harbour so the best positions and methods can be found. When reefing always hook in the tack cringle and tighten the halyard before taking up the last bit on the clew to avoid pulling the luff of the sail away from the mast.

Use the reefing pennant lock-off cams and slack off the hauling end from the winch.

#### Navtec Integral backstay adjuster -17

The adjuster incorporates pump, gauge, release and relief valves. The relief pressure is set to 5000 psi. Do not use more than 3000 psi. The integral tensioner has no return pressurizing possibility.

If you are interested to know the actual force in lbs, consult the appended hydraulic force diagram.



## OPTIONALS

### Navtec System V Hydraulics

These are available with either a single panel gauge, showing the pressure of the selected function only, or with multiple gauges for continuous pressure read-out of all functions.

The size of the hydraulic cylinders is adapted to the strength of the attached stays.

The maximum pressure is limited by an internal relief valve, factory set to open at 4000 psi.

The relief valve is in effect only for the function selected on the panel.

Nautor recommends that a maximum pressure of 3000 psi be used. The cylinder load can conveniently be expressed as a fraction of this, for example 1000 psi means one third load.

If you are interested to know the actual force in lbs, consult the appended hydraulic force diagram.

|             |                     |                          |
|-------------|---------------------|--------------------------|
| Backstay    | -17 S               | (S denotes short stroke) |
| Vang        | -12                 |                          |
| Babystay    | -10 S               |                          |
| Flatt. reef | -10 with 20" stroke |                          |

The hydraulic system is filled at the yard with BP Energol HLP 32 and has an oil container above the panel. The level in this container should be checked periodically. Always use the right oil, i.e. meeting ISO VG 32 specifications.

The boom vang has high pressure gas return, which will force the boom up when the hydraulic pressure is released.

The other cylinders are provided with tire valves so their return side can be pressurized with air to make them extend when the hydraulic pressure is released. Recommended air pressure is 8.5 kp/cm<sup>2</sup> (120 psi) with the cylinder fully extended.

Note: With a hydraulic boom vang, the panel selector valve should be set in VANG position when running in broaching conditions. The relief valve is then in effect if the boom eventually is submerged. Also, the manual release is ready for immediate use.

Keep the mast fairly straight. A mast bent out of column cannot support the masthead properly. The result is that not enough tension can be developed in the headstay to reduce genua luff sag to an acceptable level. Mast bend should be limited to about one mast diameter. (Measured halfway up between gooseneck and mast top).

### Warning

A heavily loaded vang in combination with excessive mast bend will overload the mast at deck level.

Mast bend should be induced mainly by backstay tension, and not by the babystay, which is used together with the runners to stabilize the mast.

Do not let crew members unfamiliar with the hydraulics work them. Always keep an eye on the rig when making adjustments.

Do not use cleaners containing ammonium on bronze turnbuckles, as it could cause cracking of the material.

Headsail furling gear

It is recommended that a rope halyard be used with a furling headsail. If the halyard ever is wrapped around the top end of the furling section, rope is less likely to cause damage.

**WARNING:** The headstay attachment on the bow must be reinforced for a hydraulic headsail furling unit. The standard bow fitting cannot take the combined tension and torque loads introduced by this gear.

Mainsail furling

Inside the mast is a furling section similar to the one fitted on headstays. It is of utmost importance that the halyard is not wrapped around this section. As it is impossible to verify this from deck level, a trip to the masthead is necessary before the mainsail is hoisted for the first time.



## 9. HAULING & STORAGE

Docking plan appended.

### Hauling

If slings are used, they should preferably have a frame spreading the slings so they come down to the deck edge vertically. Otherwise they must be long enough to avoid excessive pressure at deck edge. The slings must be securely fastened so they cannot slip, and be carefully positioned not to damage propeller shafting or any protruding fittings. Be sure that the slings are clean on the inside surface to avoid scratching the hull under the heavy loading.

### Storing on a cradle

The greatest part of the weight must be taken by the keel, with well padded supporting struts at bulkheads or stringers. There must be a stopper aft of the keel, preventing the boat from slipping backwards.

### Winter storage

- Remove the cushions and curtains, and preferably all loose gear.
- Clean the boat throughout, and leave the floorboards and doors open for airing.
- If freezing temperatures are expected, empty all tanks, piping, and pumps containing water. Pump impellers also need to be removed, otherwise they will harden and are useless the next season.
- Fuel tanks should preferably be empty.
- Take out the batteries and have them charged regularly.
- The winter is the best time for curing any faults. Carry a notebook onboard and record jobs needed when fresh in your mind.

10. SPARES

The following spares are included with each boat:

Engine spares

| PART NO | DESCRIPTION            | PIECES |
|---------|------------------------|--------|
| 824823  | Fuse box               | 1      |
| 829913  | Filter insert          | 1      |
| 840879  | Sealing agent 25G      | 1      |
| 858283  | Electric tape          | 1      |
| 858301  | Bag                    | 1      |
| 952969  | Rubber hose 15.9 x 4   | 1 m    |
| 958306  | Drive belt HC 38 x 900 | 1      |
| 19923   | Bulb 12 BA7S           | 2      |
| 190990  | Copper gasket 6.4 x 11 | 5      |
| 418411  | Sealing ring           | 2      |
| 418445  | Sealing ring           | 2      |
| 803730  | Carrier screw          | 1      |
| 825940  | Impeller for 3/4 pump  | 1      |
| 826244  | Gasket for 3/4 pump    | 1      |
| 829714  | Sealing ring 12 x 2.4  | 2      |
| 831752  | Connection pipe        | 2      |
| 838929  | Electrode              | 1      |
| 840384  | Screw M4 x 8           | 2      |
| 846282  | Set-up instructions    | 1      |
| 858284  | Box                    | 1      |
| 907834  | Split pin SP 2.5 x 18  | 2      |
| 948210  | Strip clamp 45         | 10     |
| 957170  | Gasket 6.5 x 9.5       | 5      |
| 957175  | Gasket 12 x 15.5       | 5      |
| 957178  | Gasket 14 x 18         | 5      |
| 961665  | Hose clamp TYPB-24     | 4      |



Electrical spares

| PART NO          | DESCRIPTION     | PIECES |
|------------------|-----------------|--------|
| Bulbs            |                 |        |
| 12864            | 12V 5W S8,5     | 2      |
| 12400            | 12V 10W BA15d   | 3      |
| 12402            | 12V 15W BA15d   | 2      |
| 12844            | 12V 5W S8,5     | 5      |
| 12849            | 12V 3W S8,5     | 2      |
| 12850            | 12V 15W S8,5    | 5      |
| 12913            | 12V 2W BA9s     | 2      |
| 904-00193        | 12V 25W         | 4      |
| 904-00192        | 12V 18W         | 2      |
| LED LFM 035 4224 | red 12V         | 1      |
| LED LFM 035 4225 | green 12V       | 1      |
| LED LFM 035 4226 | Yellow 12V      | 1      |
| Porcelain fuse   | 8 A             | 5      |
| Porcelain fuse   | 16 A            | 5      |
| Porcelain fuse   | 25 A            | 5      |
| Glass fuse       | 1 A 5 x 20 mm   | 5      |
| Glass fuse       | 2 A 5 x 20 mm   | 5      |
| Glass fuse       | 5 A 5 x 20 mm   | 5      |
| Glass fuse       | 6,3 A 5 x 20 mm | 5      |
| Handybox         |                 | 1      |

11. TOOLS

Engine tool kit

| PART NO   | DESCRIPTION                            | PIECES |
|-----------|--|--------|
| 804771    | Screw driver                           | 1      |
| 806282    | Hose                                   | 1      |
| 833757    | Oil bilge pump                         | 1      |
| 835964    | Pipe                                   | 1      |
| 841046    | Hose                                   | 1      |
| 841527    | Plastic pipe                           | 1      |
| 858274-78 | Double wrenches 8, 10, 13, 17 mm, 1/2" | 5      |
| 858279    | Combination pliers                     | 1      |
| 858280    | Knife                                  | 1      |
| 858281    | Tool bag                               | 1      |
| 941405    | Hose                                   | 1      |
| 963929    | Screw driver                           | 1      |
| 962183    | Screw driver                           | 1      |
| 755       | Spanner 8"                             | 1      |
| 914003    | Allen key 5 mm                         | 1      |
| 814005    | Allen key 10 mm                        | 1      |

Except engine tool kit, there are no tools supplied with the boat. We recommend purchase of at least the following:

Screwdrivers of various sizes, both Phillips and regular.

A hammer

A hand drill with bits

Several pairs of pliers

A set of open end wrenches

A set of socket wrenches

Several adjustable (Crescent type) wrenches

Several files

Wire cutters large and small

A center punch

A hack saw with spare blades

A keyhole saw

Some knives

A tape measure

A folding rule

A wall scraper

Grease for winches

Winch tools

Lubricants and corrosion preventers

We consider this list to be a bare minimum.

Note: Nautor offers as an optional extra two tool kits, one for cruising and one for offshore racing, which contain many of these items and some others.