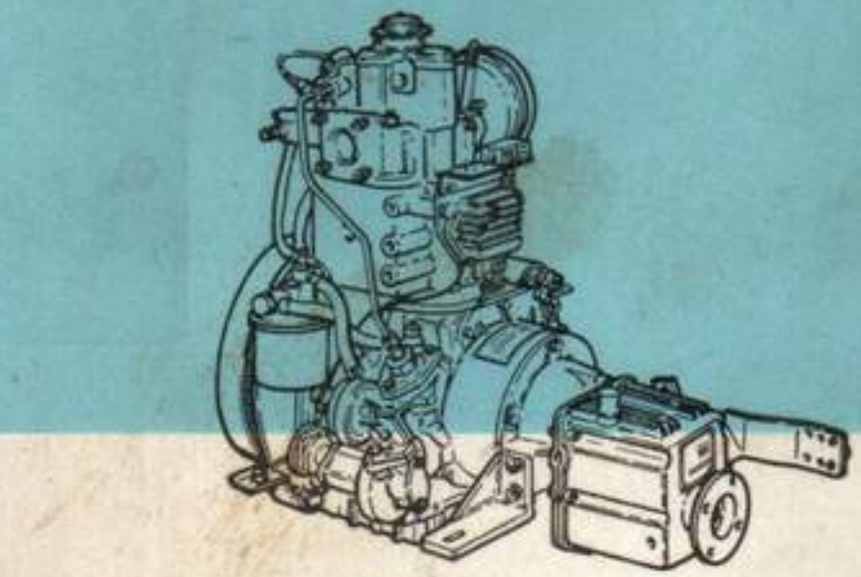
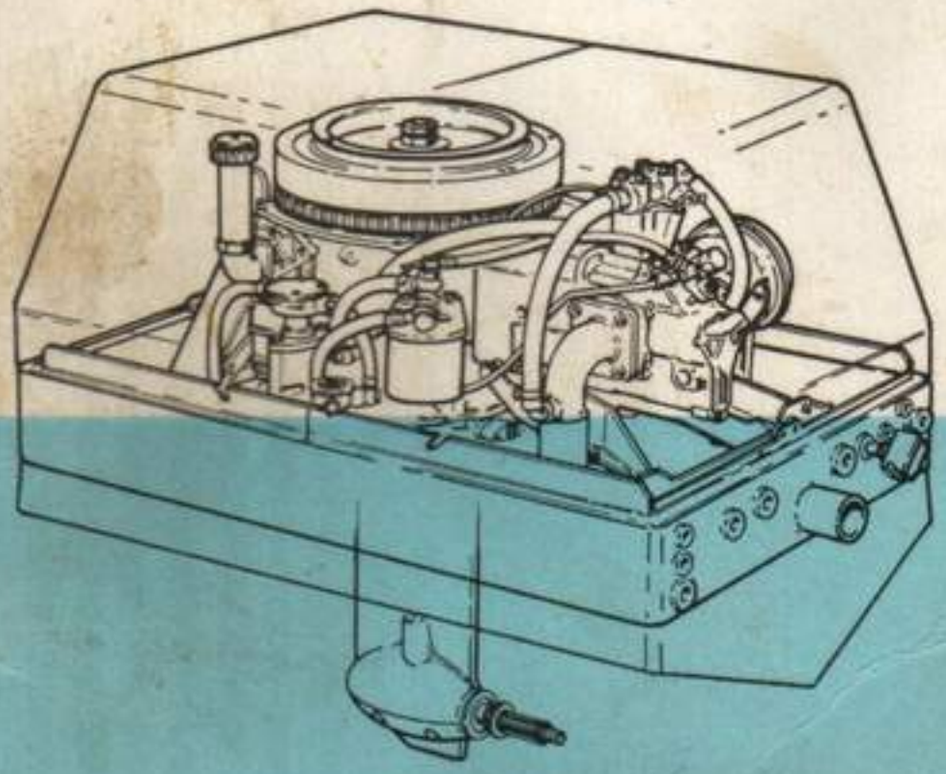
BUKH DIESEL





Owner's Handbook

for

DV 10 L ME and DV 10 L SME

The guarantee does not restrict the buyer's rights according to the general rules of current legislation.
The table below is to be filled in by the boat builder/supplier for owner's use in case of future enquiries concerning engine and equipment.

Engine No. .....

Gear No. .....

Key No. .....

Make of propeller .....

Size .....

Make of propeller shaft .....

Length .....

Taper .....

Make of stern tube .....

Length .....

Dimension .....

Make of front stern stuffing box

.....

Type .....

Make of rear stern tube bearing

.....

Type .....

Further equipment not supplied by BUKH

.....

.....

.....

.....

OWNER'S HANDBOOK
FOR
BUKH MARINE DIESEL

DV 10 L ME and DV 10 L SME

BUKH MOTORFABRIKEN
BUKH A/S

MOTORFABRIKEN BUKH A/S . DK-4400 KALUNDBORG
TELEPHONE (03) 51 14 00 . TELEX 44347 . CABLES: BUKHDIESEL

CONTENTS

	Page
Introduction	3
Pictures for recognition of details	4, 5, 6, 7 and 8
Operating manual	9
Preparation for the first start	9
Running the engine after having been put into service	11
Before starting	11
Electric start	11
Hand starting	12
Starting aid	13
After starting	13
Manoeuvring	14
Stopping	14
Running-in	15
Maintenance	16
Air filter	16
Fuel filter	16
Fuel	16
Lubricating oil sump	17
Cooling system	17
Quality of lubricating oil	18
Lubricating oil filter	18
Lubricating oil system	19
Marine gear	20
Sail drive	21
Electrical system	22
Operating panel	23
Wiring-diagram	24 and 25
Winter storage of the engine	26
Preparation of the engine before launching in spring	27
Galvanic corrosion	27
Maintenance table	28
Irregular operation – causes and remedies	29
Technical data	30

Introduction

Read this instruction book thoroughly before starting your new BUKH Diesel Engine.

No BUKH diesel engine is sent from the factory without having been thoroughly tested.

The tests have shown that the engine in all aspects is working satisfactorily and is generating its full power.

You will expect the engine to work reliably without giving any problems, and to achieve this you are asked to follow the instructions in this manuel.
By so doing, you will get the best from your BUKH engine.

If a problem with the engine should arise, we ask you to apply to one of our dealers, who will always be ready to help you, having skilled personnel, necessary tools etc., and at the same time you will be sure that only original BUKH spare parts are used.

Do always use original BUKH spare parts.

When ordering spare parts at the dealer please state:
Engine type and serial number, description and number of parts.

We wish you good boating with your new BUKH engine!

MOTORFABRIKEN BUKH A/S

BUKH reserve the right to alter specifications without notice.

1. Temperature switch
2. Fuel pressure pipe
3. Oil hole for cold start
4. Lifting bracket
5. Plug for water draining
6. Injection pump
7. Bracket for control cable
8. Oil dipstick for gearbox
9. Reverse-reduction gear
10. Bracket for reversing cable
11. Flange coupling
12. Cooling water outlet
13. Automatic ventilation
14. Fuel filter
15. Oil dipstick
16. Fuel lift pump
17. Cooling water pump

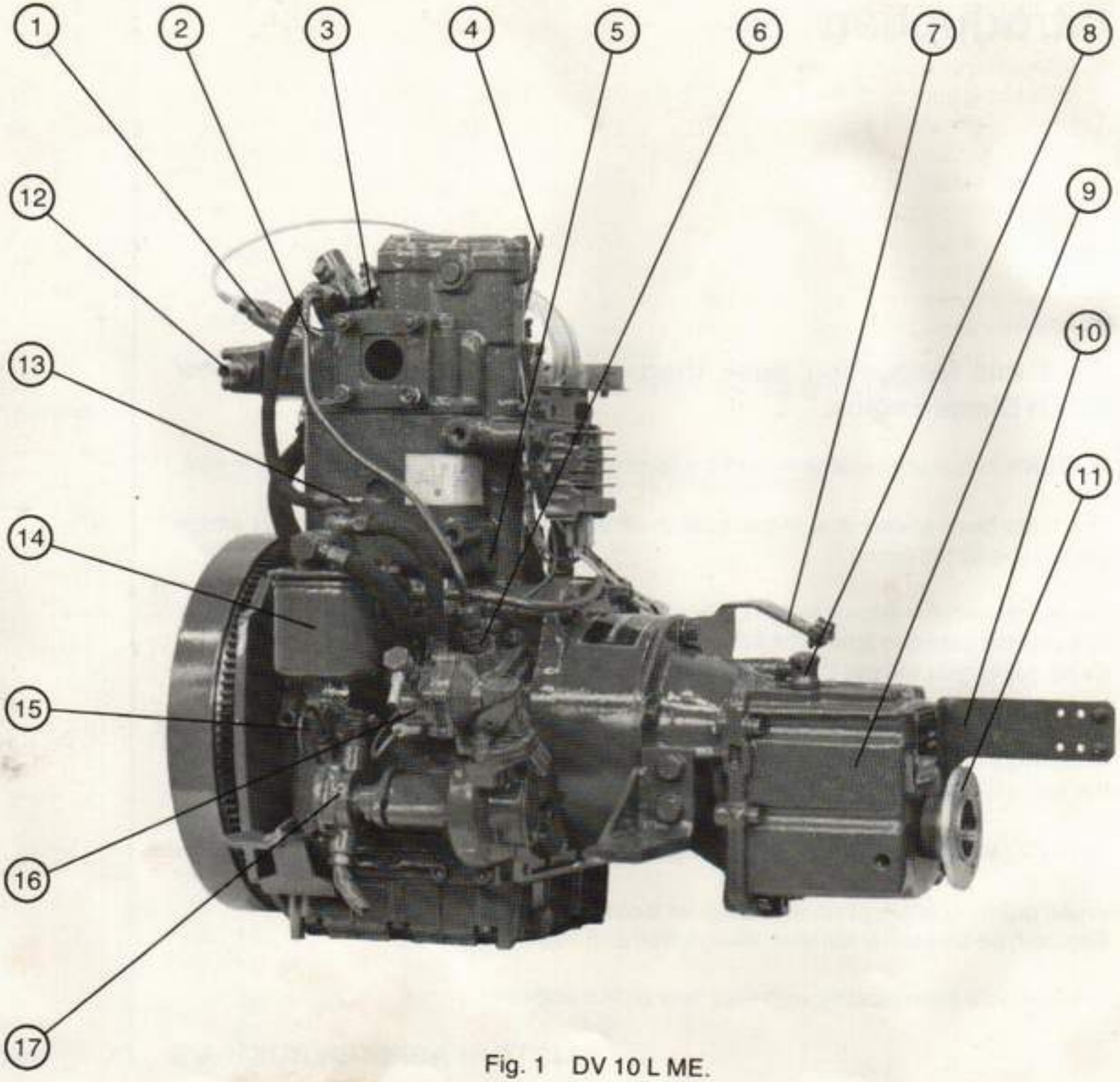


Fig. 1 DV 10 L ME.

18. Charging relay
19. Multiple plug
20. Air cleaner with silencer
21. Oil filling cap
22. Decompression lever
23. Fuel injector
24. Thermostat housing
25. Flywheel ring gear
26. Rope starting pulley
27. Starter motor
28. Throttle lever
29. Stop solenoid
30. Gearbox selector

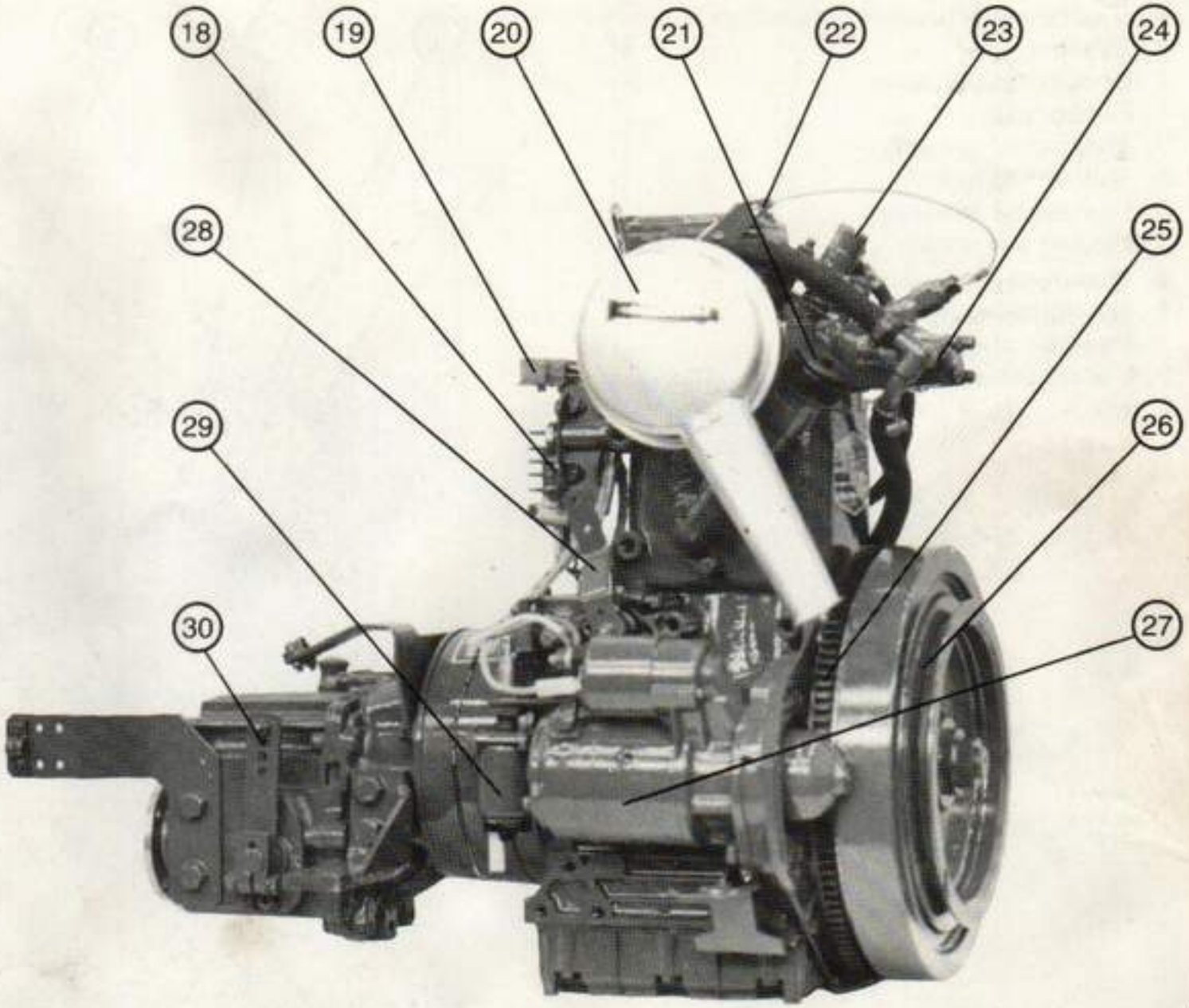


Fig. 2 DV 10 L ME.

1. Syphon effect breaker connection
2. Exhaust
3. Decompression lever
4. Rubber plug
5. Thermostat housing
6. Fuel spill to tank
7. Fuel supply from tank
8. Cooling water inlet
9. Operating panel
10. Control cable
11. Reversing cable
12. Battery cables

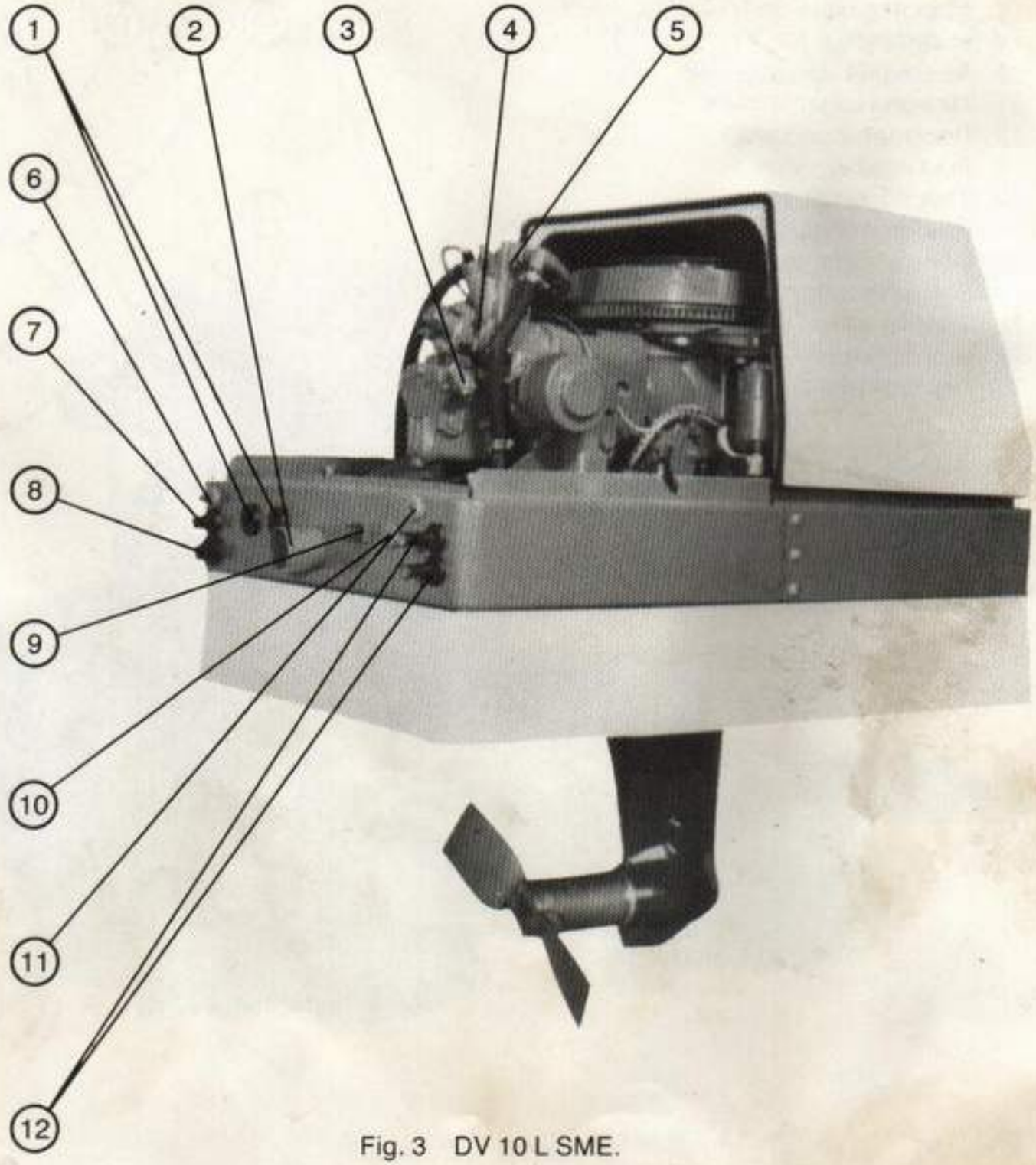


Fig. 3 DV 10 L SME.

1. Rubber plug for cold start
2. Fuel injector
3. Sensing element for cooling water thermometer
4. Air filter with silencer
5. Gear-shifting lever
6. Throttle lever
7. Revolution adjusting screw
8. Flywheel
9. Decompression lever
10. Cooling water drain plug
11. Cooling water outlet for exhaust
12. Exhaust bend
13. Flexible supports
14. Plinth

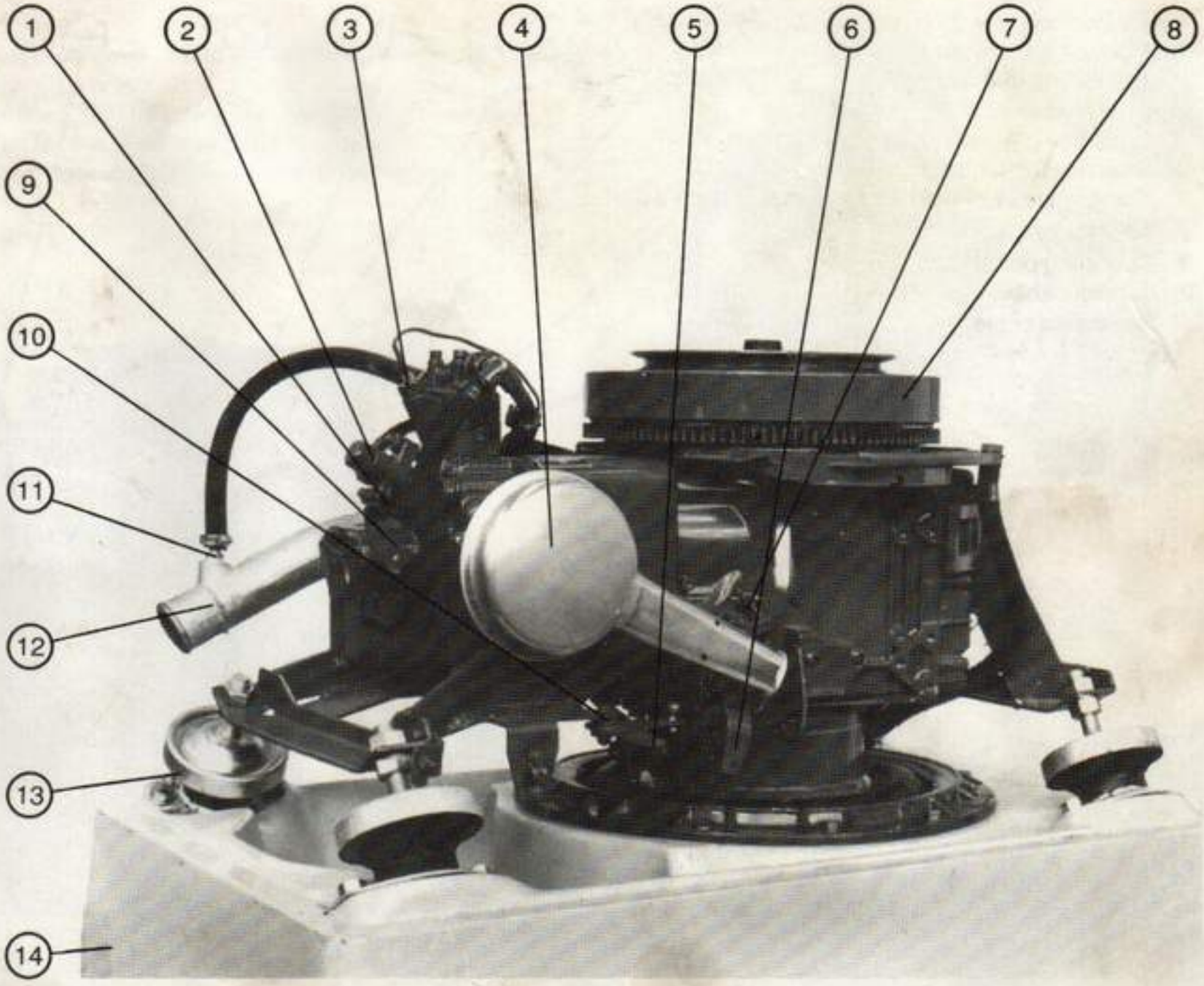


Fig. 4 DV 10 L SME.

1. Oil dipstick
2. Cooling water pump
3. Oil filling cap
4. Fuel lift pump
5. Fuel filter
6. Thermostat housing
7. Cooling water outlet hose
8. Exhaust bend
9. Oil filling – Sail-drive
10. Cooling water inlet
11. Dipstick for sail-drive
12. Flexible support
13. Engine base frame
14. Membrane alarm sensor

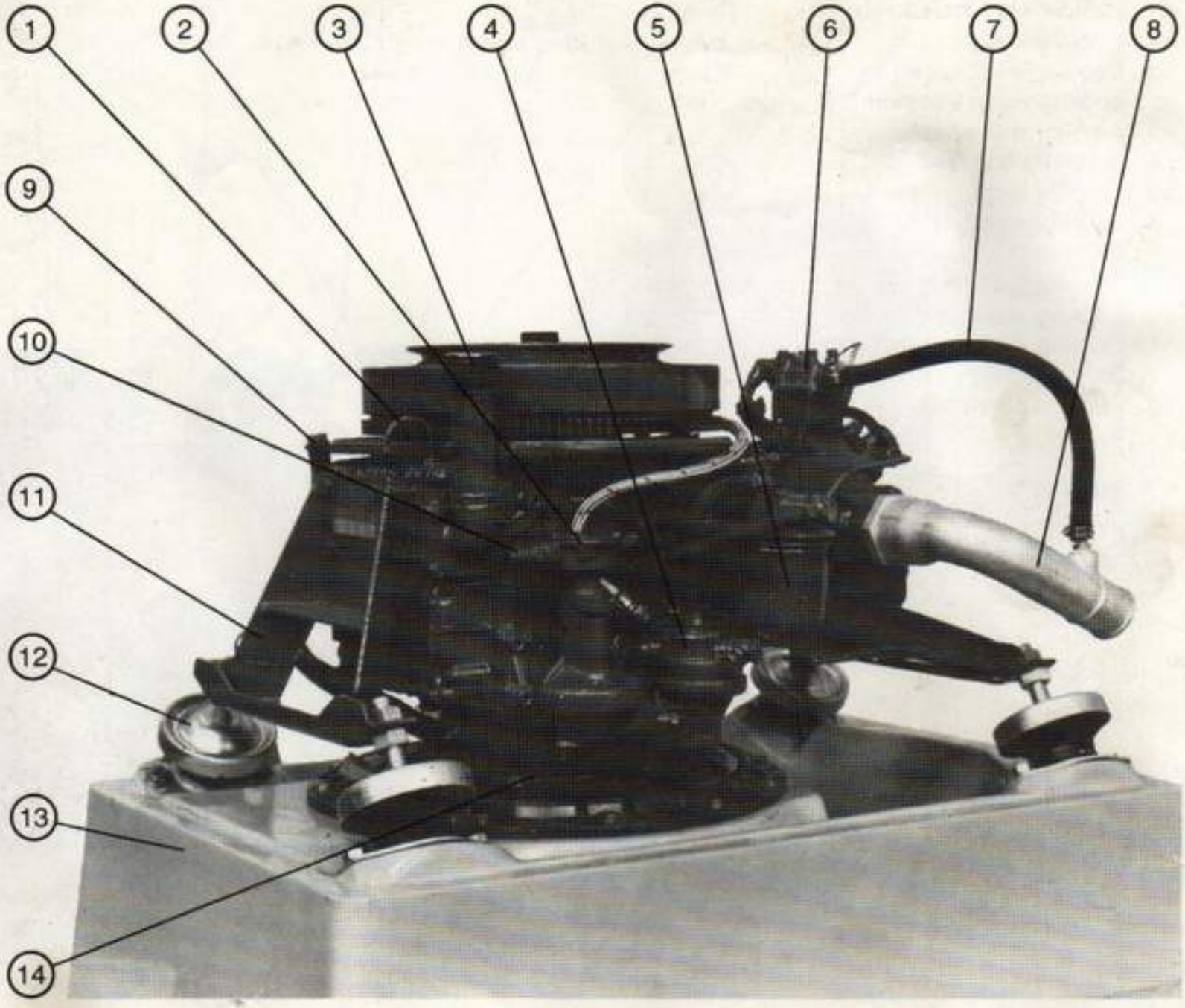


Fig. 5 DV 10 L SM.

OPERATING MANUAL

Before the engine is put into use you are recommended to get familiar with the placing of the following components of engine and gearbox:
Fuel oil filter, lub. oil filter and air intake filter, fuel lift pump with handle, water-separator for fuel (when fitted) and main switch for the electrical system.
Where is lub. oil poured in the engine and gear and where are the dipsticks placed – in engine, gearbox/saildrive?
Where is fuel oil filled in the fuel tank?

Fig. 6.

Preparation before first Start

1. Pour lubricating oil through the filling hole on engine (fig. 6a).
   Check that oil level is between the marks on the dipstick.
   Check oil level as mentioned below:
   a. Remove and wipe dipstick.
   b. Reinsert dipstick in the pipe, slowly down to the bottom.
   c. Withdraw dipstick, check oil level.
2. Pour lubricating oil through dipstick hole in the gearbox and check oil level the following way:
   a. Remove and wipe dipstick.
   b. Insert dipstick slowly.
   c. Withdraw dipstick and check oil level. The oil level must be between the two marks on the dipstick.
3. Flexible sterntube: Lubricate the stuffing box with S.A.E. 90 sterntube oil.
   Unscrew the filler plug and oil is poured in until the bearing is full (for DV 10 L ME).
   IMPORTANT: The stuffing box must under no circumstances be force-lubricated.
4. To have a reliable check we always recommend checking of oil level **before** starting engine.
   These instructions are only valid for propeller equipment supplied by BUKH.
   If other equipment is fitted, we refer to the instructions given for this.

Fig. 7.

Fig. 6a.

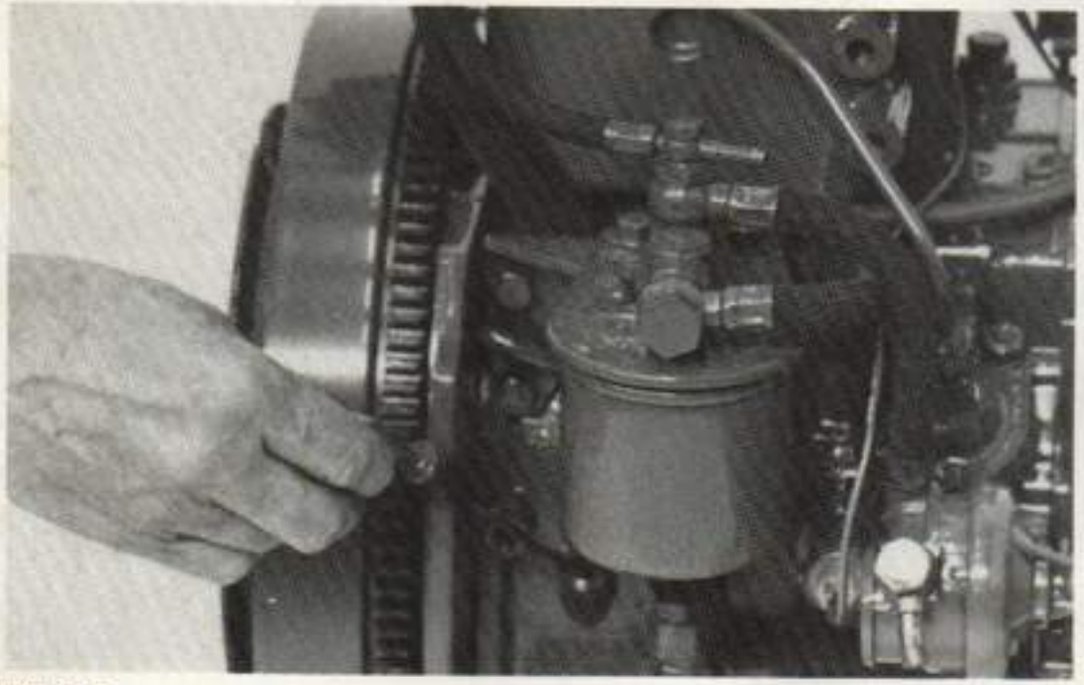


Fig. 7a.

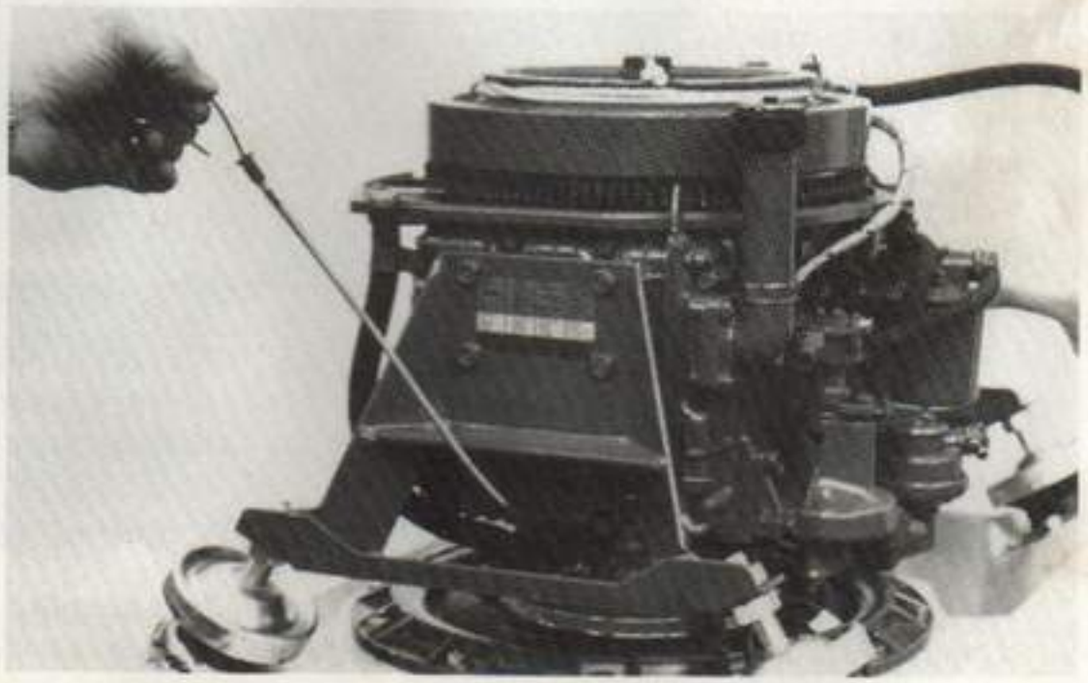


Fig. 8 DV 10 L SME

5. Fill the fuel tank.
6. Bleed the fuel system as follows:
   a. Pump with the fuel lift pump handle until fuel is free from air bubbles seen in the transparent hose to the fuel tank.
   b. Loosen fuel pipe connection on the nozzle holder, if necessary (fig. 1, pos. 1).
   c. Turn the engine until fuel is free from air bubbles.
      Retighten the pipe connection.

Normally it will not be necessary to bleed the fuel filter before the first start-up. However, after changing the fuel filter, it will be necessary. It should be done by pumping as described in point a, but loosen the slotted screw first (fig. 10). Retighten the screw when fuel discharges at the screw. It may be necessary to continue with points b. and c. Bleeding is to be carried out after any work on the fuel system.

Fig. 9.

After the Engine has been taken into use

Before start

1. The oil level of the engine should be checked every 14 days or every 25 hours of running as described in »Preparation before first start« page 9. It is not necessary to refill oil if the level is between the two marks on the dipstick.
2. The oil level of the reduction gear/saildrive should be checked every 14 days or every 25 hours of running as described in »Preparation before first start« page 9.
3. The sterntube stuffing box should be lubricated every 14 days or every 25 hours of running. (DV 10 L ME).
4. Check the quantity of fuel in the tank and drain off water, if any, from bottom of the tank or water separator if fitted.

Electrical start with remote control and instrument panel

1. Switch on the main switch (fig. 28, pos. 10).
2. Put the gear in neutral position by means of the control handle (fig. 14).
3. The engine is started by pushing in the key and turning it to the right.
   The starter should not work for more than 10-15 seconds continuously.

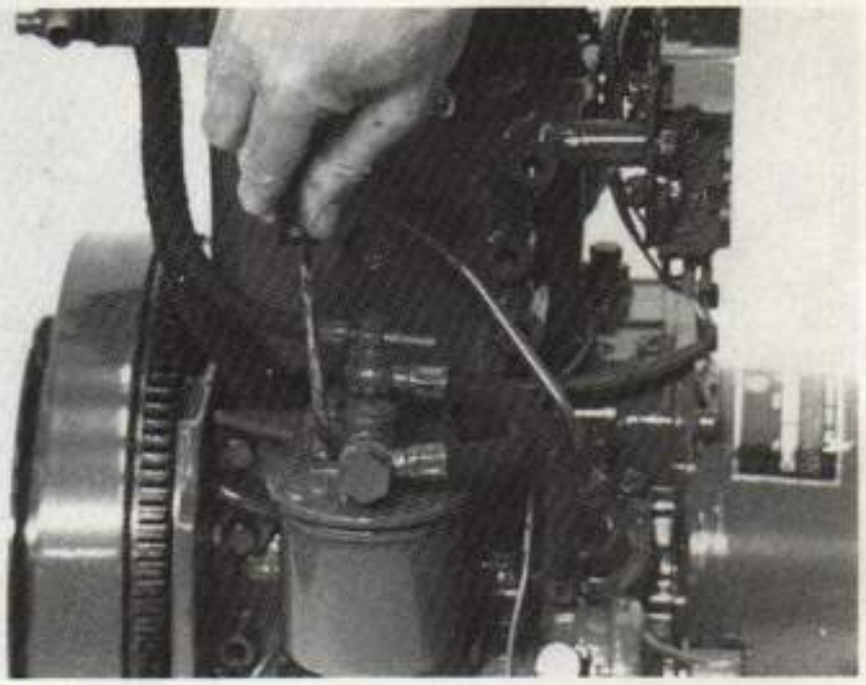


Fig. 10.

MANUAL STARTING

DV 10 L SME/DV 10 L ME – Alternative starting

1. Put the gear lever in neutral position.
2. Turn the flywheel to the right up against the compression.
3. Activate decompression lever and turn the flywheel a further ¼-⅓ turn to the right and release decompression lever.
4. Place starting rope knot in position in the notch in the flywheel and wind up the rope clockwise as far as possible. (See fig. 11 or fig. 12.)
5. Take with both hands the starting rope grip, and make sure that the space behind you is sufficient to allow you to pull out the starting rope totally.
6. Pull – hard and fast – the starting rope totally out, and the engine starts.

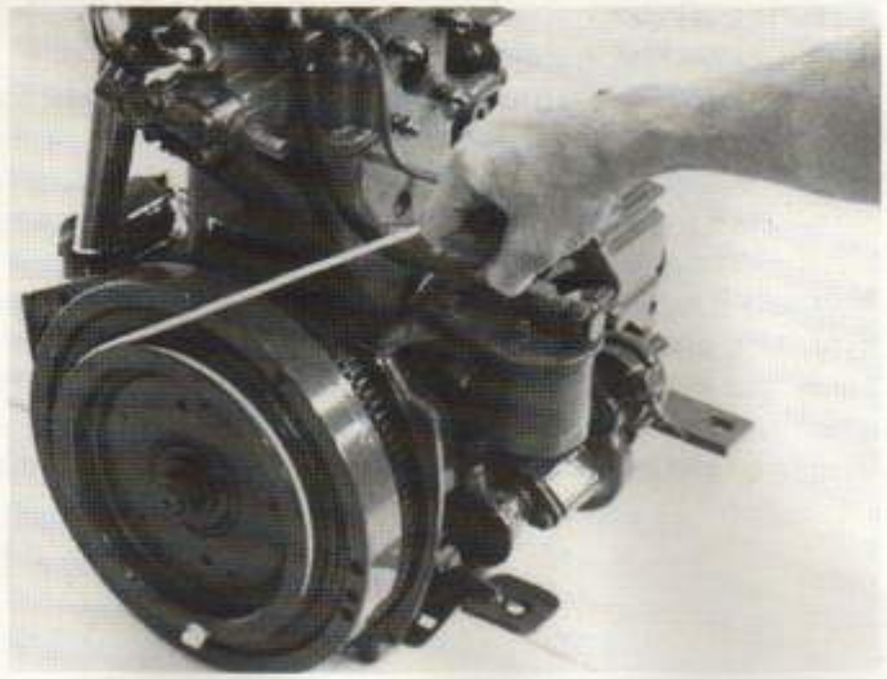


Fig. 11.

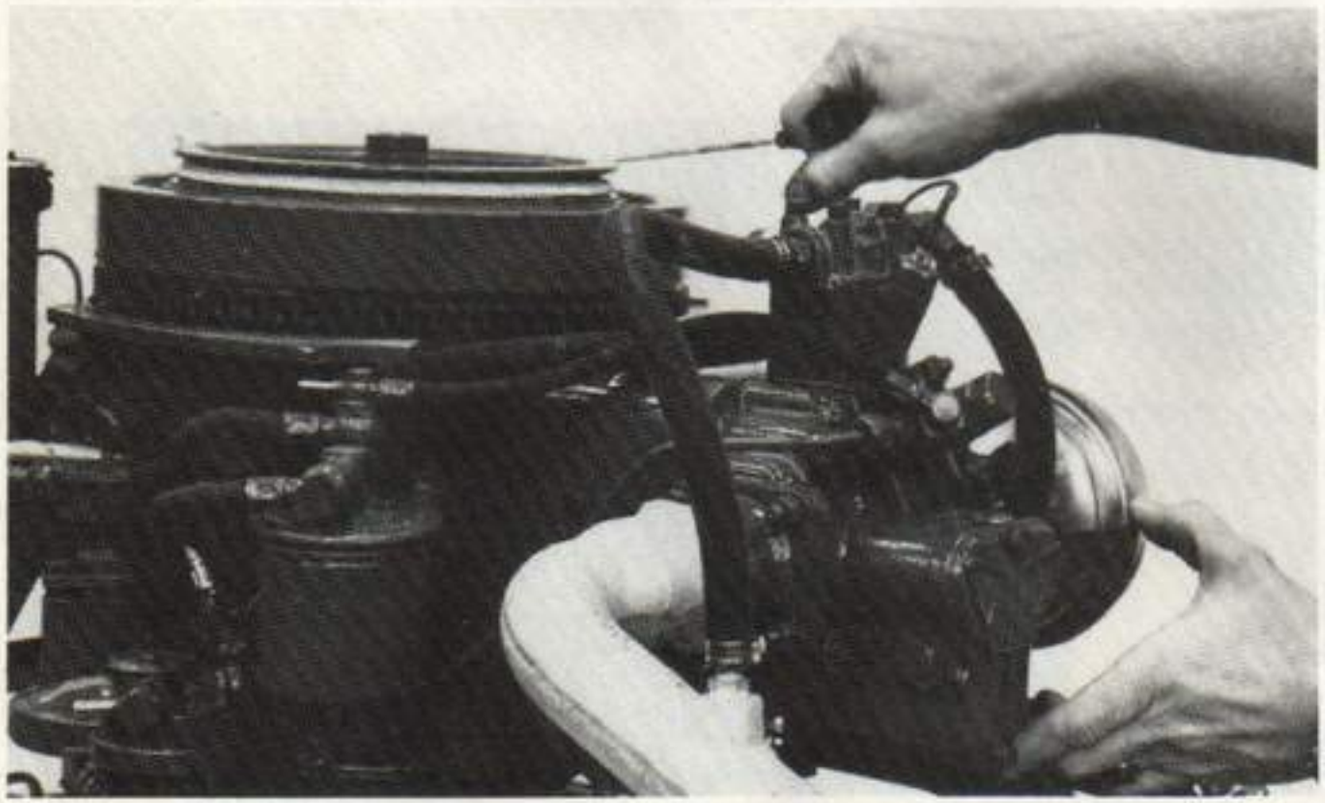


Fig. 12.

STARTING AID

In case of:

a. cold weather (temp. under 0°C),
b. insufficient compression,
c. long standstill,

the start can be made easier by removing the rubber plug (fig. 1, pos. 3), and pouring a spoonful of lubricating oil through the hole into the air inlet (fig. 13).
Wait a few seconds an re-place the rubber plug.
Actuate the decompression lever (fig. 2, pos. 22).
Turn the ignition key into the starting pos. and keep the position until the engine rotates with its full starting rotations.
Release the decompression lever, but keep the ignition key in its starting position until the engine has started (max. in this position is 10 secs.).
Start pilot may be used instead of the above-mentioned procedure.
Spray 2-3 secs. against the air inlet filter inlet whilst the starter is actuated.
Stop spraying as soon as you hear the first firing.

Fig. 13.

After start

1. Check that all control lamps go out immediately after the idle speed revolutions of the engine have been reached.
2. Check that there is cooling water in the exhaust.
3. Do not accelerate immediately after start.
   Let the engine rotate at idle speed for 5-10 min.
   Then increase the load smoothly in the next 10-15 min.
4. If points 1 and 2 are not functioning, the engine must be stopped immediately.

Fig 13a.

MANOEUVRING

1. With the control lever in central position the engine is idling, and the marine gear is in neutral (pos. 0).
   When the lever is moved forward in range 1, the marine gear is engaged to »Ahead« first, and then the engine R.P.M. is increased in range 1-2.
   When the lever is moved from the central position to range 3, the marine gear is engaged to »Astern« first, and then the engine R.P.M. is increased in range 3-4.
2. Only engage »Ahead« or »Astern« when the engine is idling.
3. To accelerate engine without engaging gear operate gear release button 5 and move control handle in either direction.
4. Alternatively to the shown side-mounted remote control, this can be delivered for top-mounting.
5. Reduce the load gradually in 10-15 min. before stopping the engine.

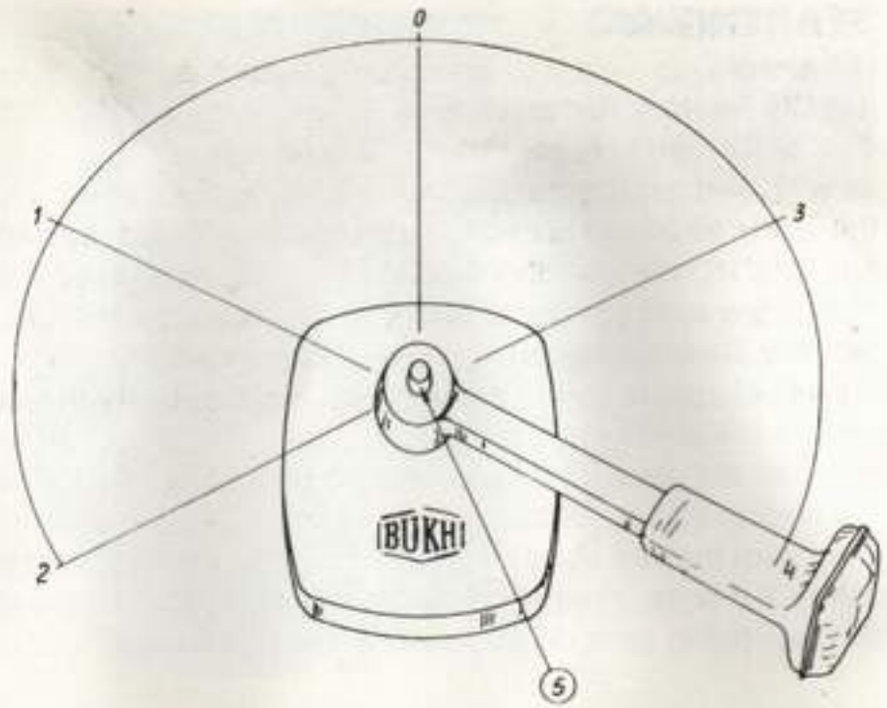


Fig. 14.
0. Idling in neutral position.
1. Idling, gear »Ahead« position.
2. Gear in »Ahead« position, increasing R.P.M.
3. Idling, gear in »Astern« position.
4. Gear in »Astern« position, increasing R.P.M.
5. Gear release button.

Warning

Never engage the saildrive when engine and propeller are stopped!
When sailing with sail and engine the control lamps and acoustic alarm will keep you informed if the lubricating oil pressure fails when max. inclination angle is exceeded.

Stopping the engine

1. Reduce the engine to idling and the gear is put in neutral position.
2. Turn the ignition key to stop position, pushing it slightly inwards. The key must not be left in this position after the engine has stopped due to the large current consumption of the stop solenoid. (See »Key Switch Function« page 23).
8. Normally the decompression lever must not be used to stop the engine, because this may damage the lifting mechanism and the valve.
4. Do not stop the engine until it has been idling for 4-6 min.

RUNNING IN

To ensure long life and maximum power it is recommended to run the engine for the first 75 hours at not more than 75 pct. of the maximum output corresponding to 2700 R.P.M. at load with propeller in free navigation.
You should avoid slow hauling such as for instance towage.
It is recommended to change the engine- and gear oil and to clean the lubricating oil filter (see fig. 15) after the first 20-25 hours of running.
The lubricating oil filter is built into the engine block and can be removed by loosening the threaded plug where the oil pressure switch is fitted.
The filter can be cleaned and thus it is not to be exchanged.

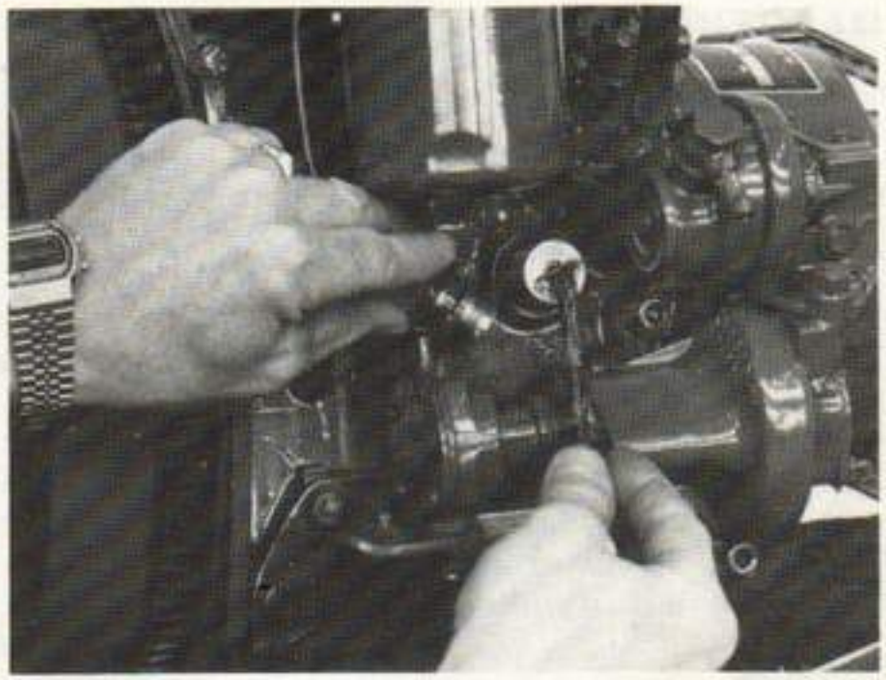


Fig. 15.

After the first 20-25 hours of running, it is recommended to let an authorized BUKH service dealer carry out an engine and installation check including the following points:

1. Change of engine oil and cleaning of filter.
2. Change of gear oil.
3. Tighten up the cyl. head to the torque stated.
4. Check the valve clearance.
5. Check the aligment (DV 10 L ME).
6. Check the fastening of the engine on the flexible supports and the plinth.
7. Check the bolts in the propeller shaft coupling (DV 10 L ME).
8. Tighten all straps on all hoses.
9. Check all functions in adjusting devices, gear shifts alarms etc.
10. Grease all movable parts in the remote control- and the manoeuvring devices on engine and gearbox.
11. Spray engine and gearbox with water-repelling silicone (WD40).

If you wish to extend the warranty period from 1 or 2 years your authorized BUKH-dealer must carry out a specified check, and the formula must be forwarded duly signed to BUKH A/S before the expiry of the 1 year warranty.

MAINTENANCE

Air Inlet Filter

This is a wire gauze filter to be cleaned in fuel oil every 200 hours and cleaned by a blast of compressed air in the opposite direction of the normal air intake.

Fuel filter

The filter cartridge (throw-away filter) should be changed every 200 hours of running or if water has come into the filter.
The change is done by screwing the filter clockwise seen from above.
The rubber seal should be changed together with the filter.
Check that the new filter is tight after it has been screwed on (counter-clockwise seen from above).
Bleed fuel system as described page 11.

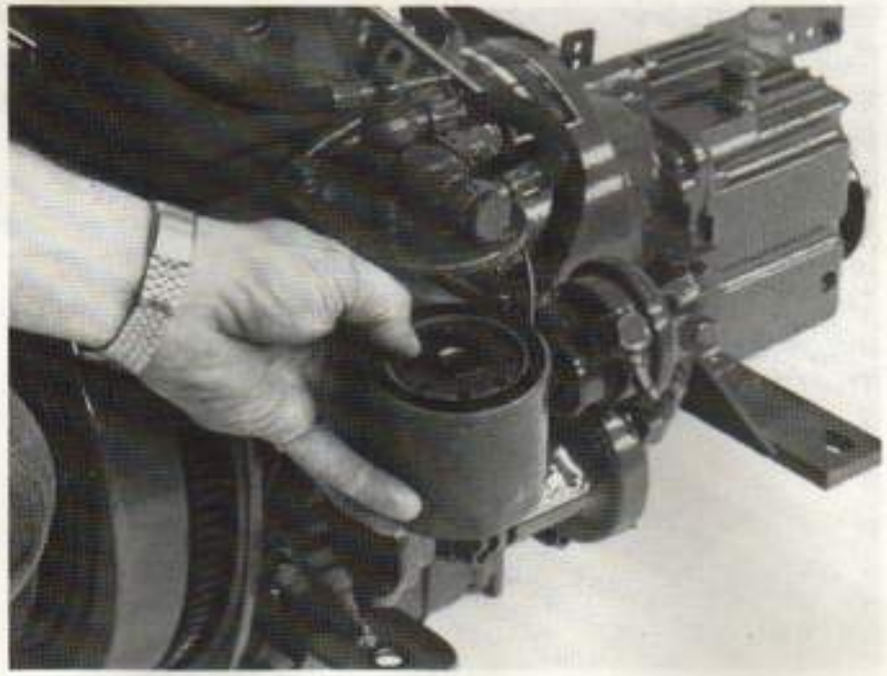


Fig. 16.

Lubricating Oil System

The lubricating oil should be changed every 100 hours of running.
The oil level is checked as mentioned under »Before Start« page 11.
If the oil on the dipstick is grey there is water in the oil and the cause must be found and corrected.

Fuel

Gas oil quality BS 2869, class A, should be used which is obtainable from recognized gas stations.
Use clean cans only when decanting.
Please check that the filling plug is watertight and tightened after filling up.
Drain the tank frequently for condensation water or use a water separator.
Ordinary fuel oil must not be used.

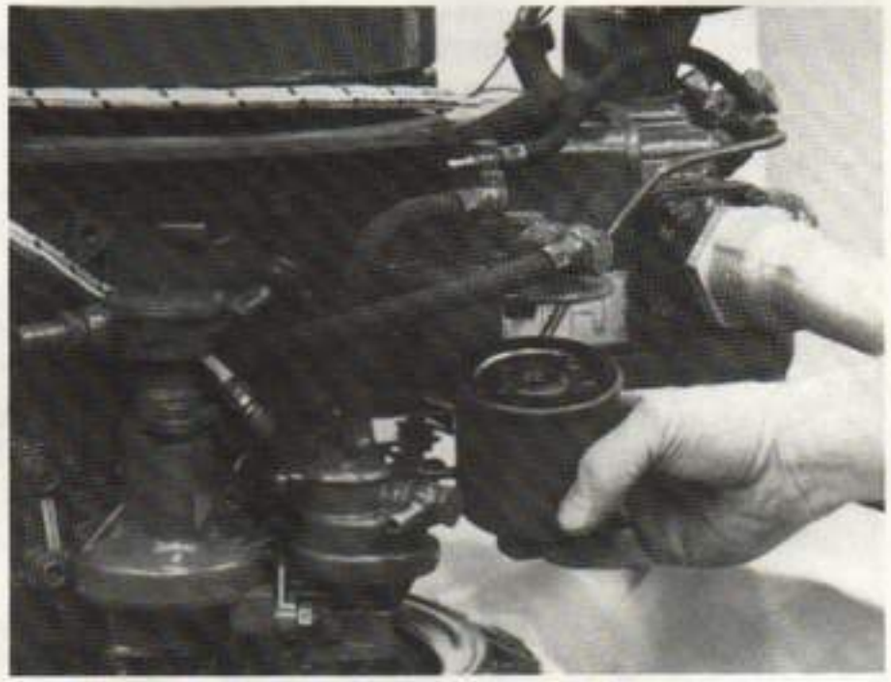


Fig. 17.

Lubricating Oil Sump

Every 600 hours approx. of running the bottom cover of the engine should be removed and the sump should be cleaned by washing it out with gas oil or kerosene.

Cooling System

The engine is salt water cooled and fitted with a thermostat to ensure that the warning temperature (50°-75°C) is reached quickly and maintained under all conditions (see fig. 18).
The cooling water is circulated by a self-priming rotary pump with rubber impeller (see fig. 19).
The rubber impeller should be taken out for relief during the winter and in long periods of storage.

Cooling Water Pump

Disassemble the rubber impeller by removing the cover of the pump, after which it is possible to pull out the rotor of the pump housing (fig. 19).
The shaft must remain in the pump during and after the removal of the impeller. When reassembling, replace the gasket under the cover.
If, during operation, water is coming out of the drain hole at the flange of the pump, the shaft seal rings in the pump housing must be replaced soonest.

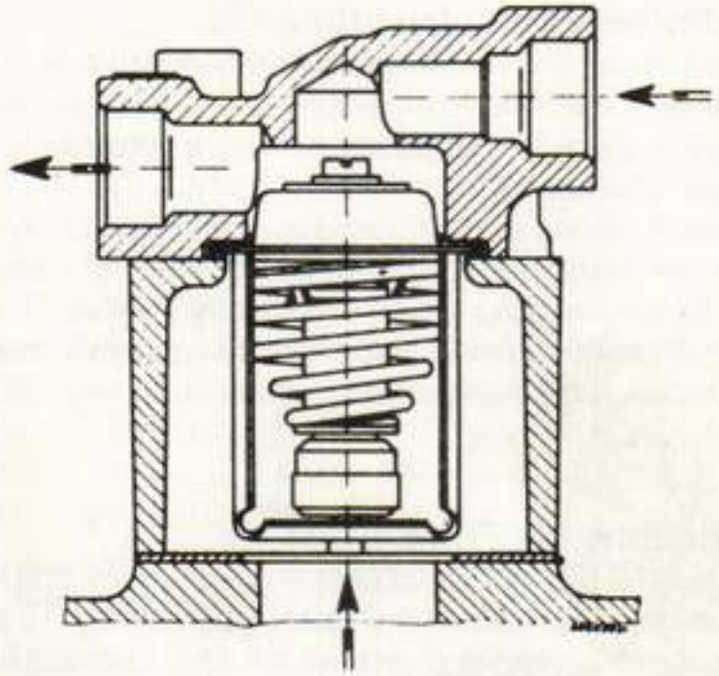


Fig. 18.

Frost Precautions

To avoid damaging the engine, drain the cooling water during frosty periods.
Draining is to be carried out as follows:

1. Turn off the sea-water connection.
2. Drain the cooling water off the engine by unscrewing the drain plug in the cylinder bottom.
   See fig. 1, pos. 5 for DV 10 L ME.
   See fig. 4, pos. 10 for DV 10 L SME.
3. In time, loose rust and other impurities collect in the cooling chamber of the engine. It is therefore recommended, when the drain plug is removed, to clean the drain hole with a piece of steel wire, a nail or the like, to be sure that all water is drained out.

For further details see »Winter Storage of the Engine« page 26.

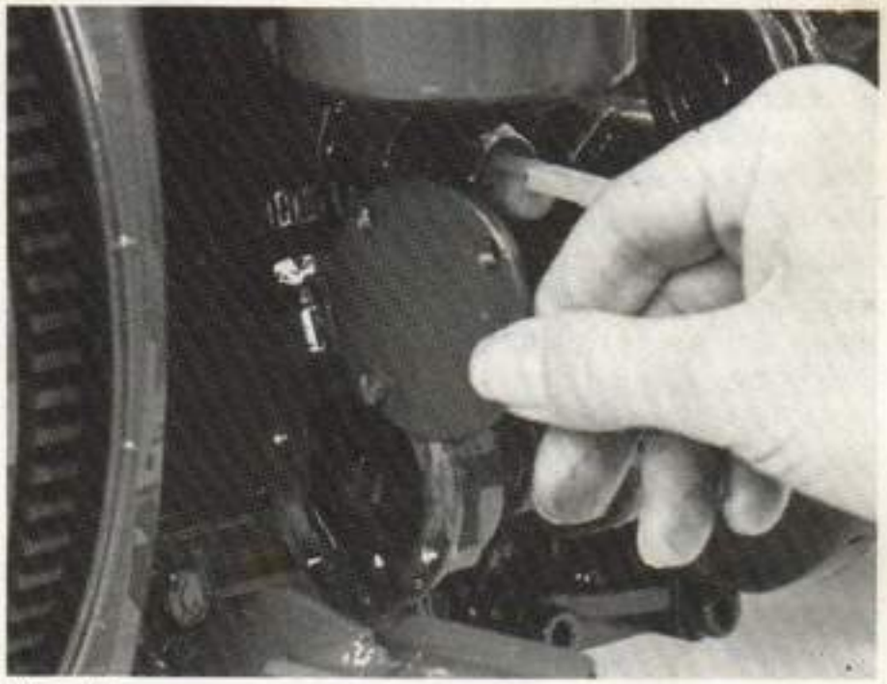


Fig. 19.

Recommended Lubricating Oil

Modern diesel engines demand heavy-duty oils with additives securing best operation and longest life time of the engine under various conditions.
Therefore use a first class HD-oil from a recognized oil company. The oil can must be marked »Service CC«.
Oil specifications as mentioned in »Technical Data«.
When operating under difficult conditions, i.e. frequent cold starting, short operation periods, very varying loads, use quality »Service CD«, and also use quality »Service CD« in case the sulphur content of fuel is higher than 1 %.
Use the viscosity mentioned in »Technical Data« at the actual air temperature.

Lubricating Oil Filter

Take out the lubricating oil filter element every 200 hours and clean it in gas oil.

1. Loosen banjo bolt on the screw cap (see fig. 15 page 15).
2. Unscrew the cap and remove the filter element from the bore.
3. Assembly is carried out in reverse order.

Fig. 20.

Fuel Lift Pump

On some of the engines a suction filter may be placed under the top cover (fig. 20) of the fuel lift pump.
The filter should be cleaned every 200 hours of running approximately, by unscrewing the center screw in the cover and removing the filter which should be cleaned in fuel and refitted.
The filter may clog up before 200 hours of running if the fuel tank/the fuel oil is very unclean. If this is the case the engine will not reach max. output and eventually it will stop due to lack of fuel.

Vacuum Valve

The vacuum valve of the engine, which is to keep up the sub-pressure in the cranckcase, is contained in the lub. oil filler cap.
The valve should be cleaned every 100 hours of operation by washing it out in gas oil (see fig. 21).

Fig. 21.

Lubricating Oil System

The engine is pressure lubricated with full-flow filter and relief valve for controling the lubricating oil pressure.
The oil level should be checked before start as mentioned on page 9.

Change of Oil

Engine lubricating oil should be changed for the first time after 20 hours of running and later every 100 hours or at least once a year. It is recommended to change the oil with warm engine, and the procedure is as follows:

1. Remove dipstick (fig. 1).
2. Insert the sump pump suction hose into the hole and pump up the oil.
3. When the sump is empty reinsert dipstick and pour fresh oil as mentioned on page 9.
4. If possible, drain the oil through the plug hole in the bottom of the sump.

Sail Drive

1. The oil should be changed once a year when the boat is on land.
2. Drain off the oil at the bottom screw, as shown on fig. 22.
3. Make sure that the gasket under the bottom screw is in order and placed correctly when the screw is refitted and that it is tightened so that complete watertightness is obtained.

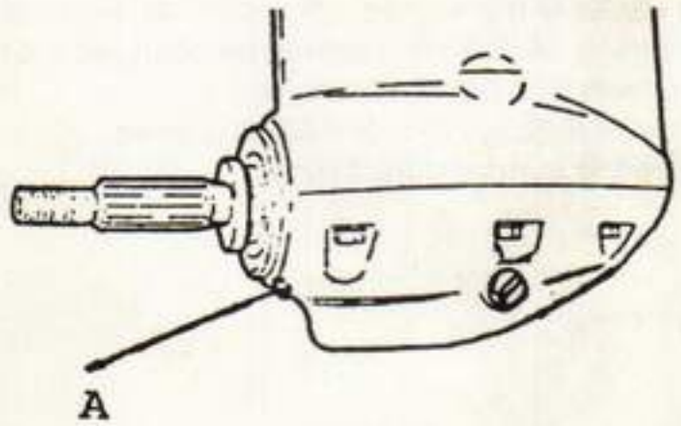


Fig. 22.

BW3-Gearbox

1. Change oil every 200 hours of running or at the annual launching.
2. Remove dipstick.
3. Insert the sump pump suction hose into the hole until it reaches the bottom and pump up the oil.
4. When the gearbox is completely empty pour fresh oil to the quantity of 0.35 ltr. as mentioned on page 9.

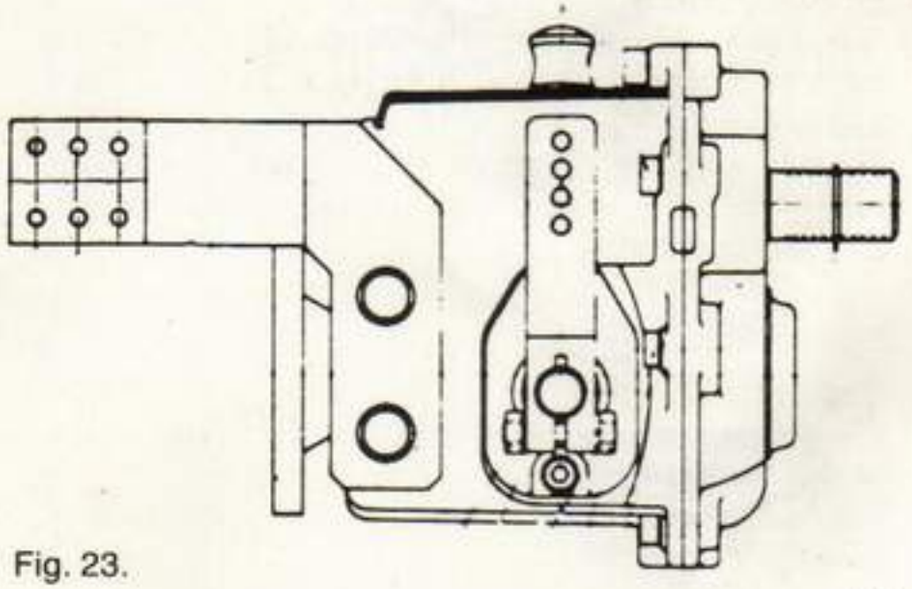


Fig. 23.

Marine Gear BW3 (DV 10 L ME)

The gear is mechanical with servo-amplified cone clutch and gear ratio (red. 2.47:1) for ahead, and chain drive (red. 2.27:1) for astern.

Out of consideration for the cone system, engagement must only take place when the engine is running idle RPM.

It is all right if the propeller rotates when being under sail. If you do not want the propeller to rotate, engage in astern.

The clutch lever has four holes for reversing cable. Usually the third hole from the shaft is applied. If the gear will not couple either to ahead or astern, move to the second hole from the shifter shaft.

The lubricating oil (0.35 ltr.) should be changed the first time after 25 hours of running and then every 200 hours of running.

HD-engine oil SAE20W/20 or SAE30 is used.

Max. operating temperature 110°C.

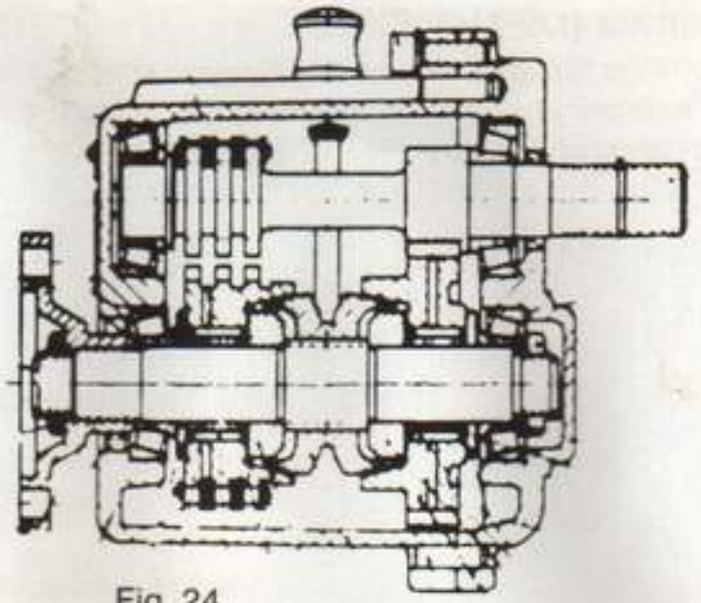


Fig. 24.

Sail Drive (DV 10 L SME)

The drive is equipped with a double membrane between leg and foundation. In the hollow space between the two membranes a dipole is inserted, which will short-circuit and activate the acoustic alarm in case of penetration of water. If this should happen and water does not enter into the boat, repair should be carried out, when the opportunity offers.

Once a year it should be checked that the upper membrane is tight by pouring water in the uttermost and innermost outer groove which the menbrane forms and see whether the alarm is released from penetrating water.

At the same time the alarm function should be checked by short-circuiting the terminals 1 and 2 on the red control box.

Tightness to the seewater is checked currently when the oil is checked, as the oil on the dipstick becomes pale grey and cloudy when it is mixed with water.

The primer on the outside of the leg should be maintained by patching/mending scraping offs, grinding through and peeling off, if any, with a two-component exposy-polyamid paint. We can supply Hempadur Hi-build No. 4520.

The zinc anode in front of the propeller must be exchanged in good time and you must make sure that the electric connection to the leg through the two fixing screws is good.

The saildrive is to be painted with the same bottom paint as the rest of the boat. Bottom paint of copper basis must not be applied.

The oil in the saildrive should be changed once a year when the boat is on land.

Drain off the oil by the delivery screw »A« at the bottom (fig. 22).

The gasket under the screw head must be intact when it is refitted.

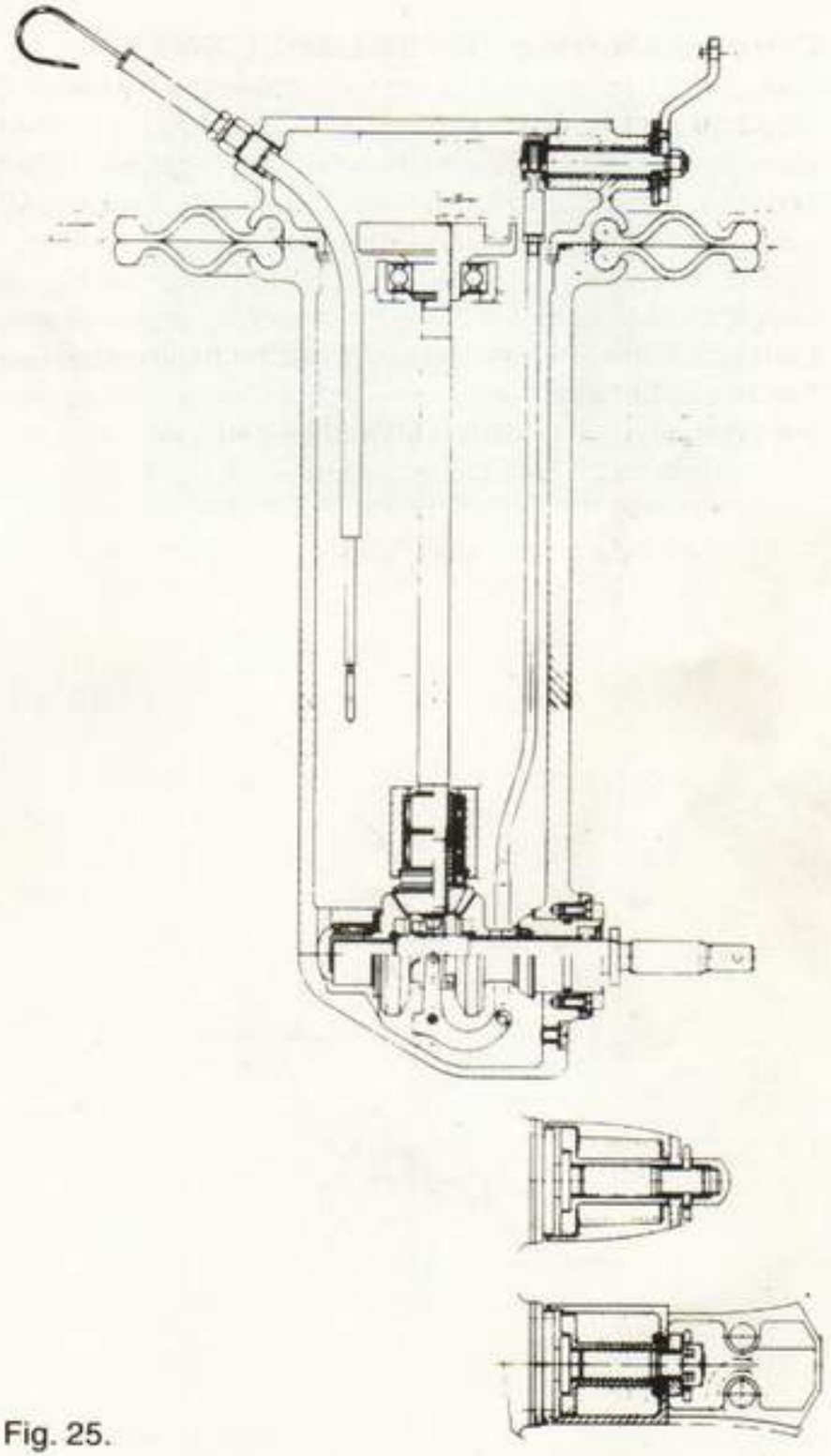


Fig. 25.

Electrical System (DV 10 L ME/L SME)

The charging generator is placed behind the flywheel. Consequently the bilge water must never come higher up than to the rope pulley on the flywheel of DV 10 L ME during standstill and to the upper edge of the foundation of DV 10 L SME.

The max. charging current of the charging generator is 15 amp. and the generator does not need maintenance.

As will appear from the electrical wiring diagram (fig. 28/29), the charging regulator should always be connected to the battery when the engine is running.

Battery and main switch (pos. 10 and 11) are optional equipment.

The level of the electrolyte should be 5-6 mm above the plates in the battery, if this is not the case top up with demineralised water.

Explanations to fig. 28 and 29
Electrical wiring diagrams:

1. Key switch.
2. Acoustic alarm.
3. Warning lamp for oil pressure
4. Warning lamp for electrical charge
5. Warning lamp for water temperature
6. Switch for oil pressure.
7. Charging alternator.

7a. Regulator.

8. Starter motor.
9. Stop solenoid.
10. Main switch (additional equipment).
11. Battery (88Ah) (additional equipment).
14. Cooling water temperature switch.
20. Diode plate.
21. Sensing element for membrane.
22. Control box.

Control Panel:

1. Key switch.
2. Warning lamp for charging current (AMP, red).
3. Warning lamp for oil pressure (OIL, orange).
4. Warning lamp for cooling-water temperature (TEMP., blue).
5. Acoustic alarm for oil pressure and cooling-water temperature.
6. Blank (can be replaced by thermometer and manometer or fuel gauge and hour-counter).

Key Switch Functions:

Pos.

a. Switched off (pos. before insertion and removal of key).
b. Warning and instrument lamps are alight.
d. Start.
e. Engine stop.

NOTE:
In order to reach positions »d« and »e«, the key body must be depressed by means of the key.

→ The switch should not be left in pos. »e«, because of the heavy consumption of current by the stop solenoid. The alarm functions are tested in pos. »e«.

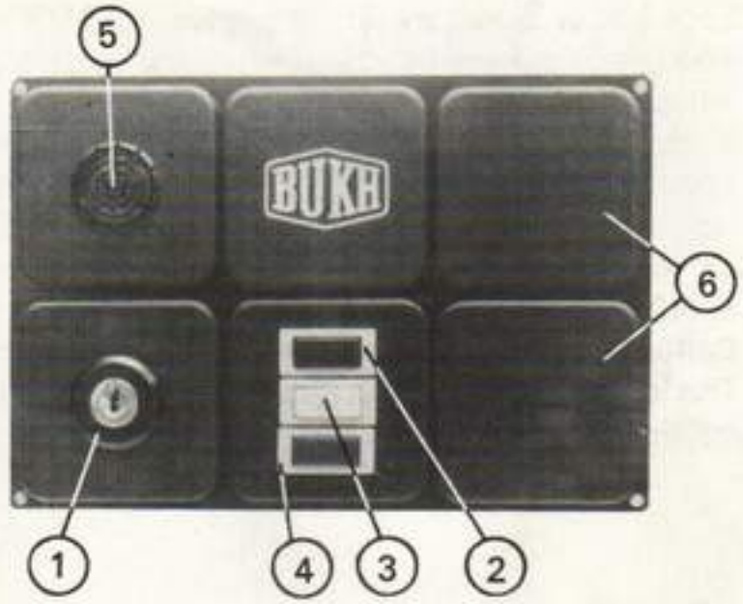


Fig. 26.

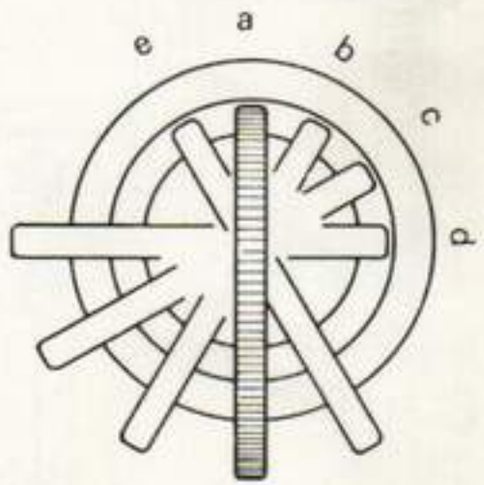


Fig. 27.

DV 10 LME

Brun	brown	braun
Rød	red	rot
Grøn	green	grun
Sort	black	schwarz
Blå	blue	blau
Gul	yellow	gelb
Hvid	white	weiss

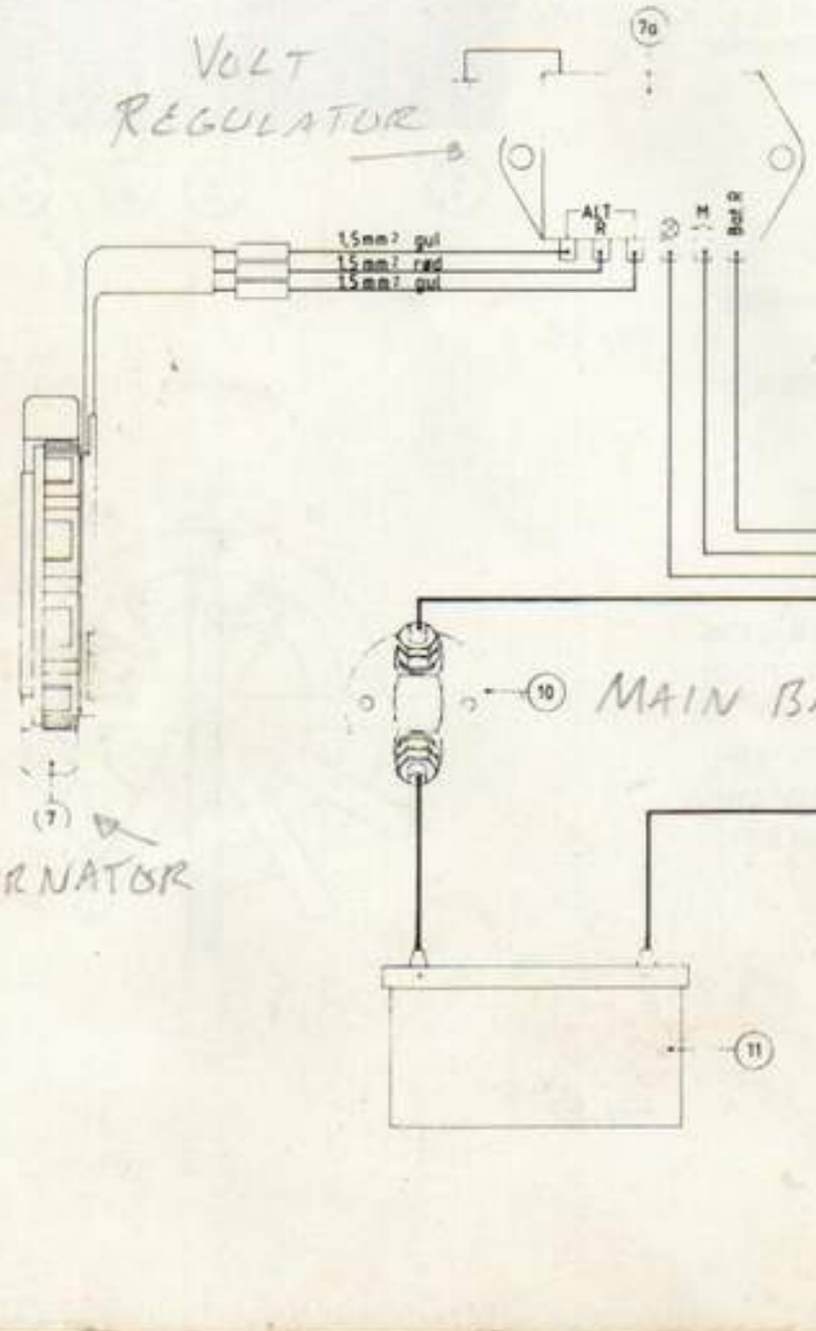


Fig. 28.

10 L SME (SAIL DRIVE)

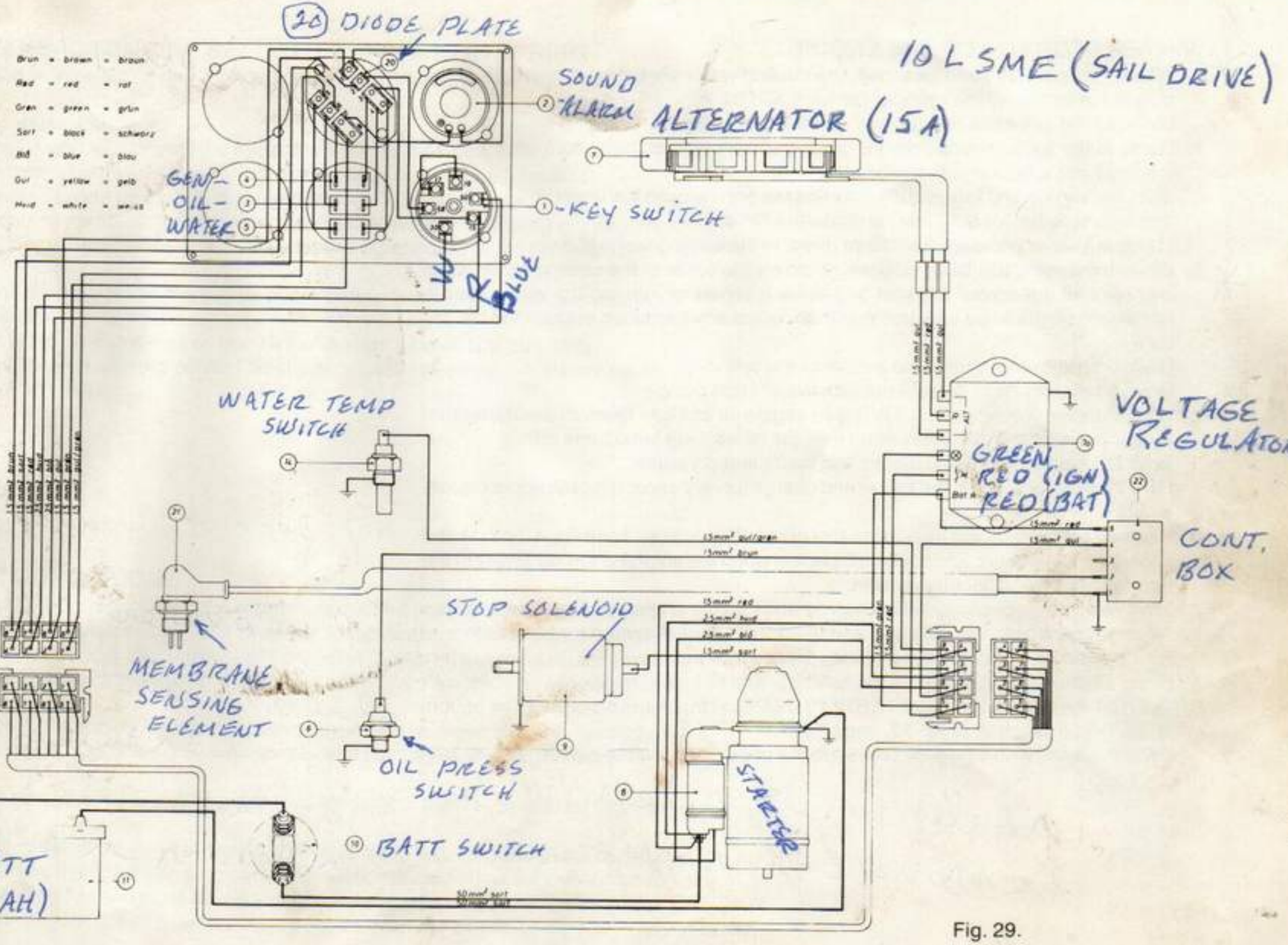


Fig. 29.

WINTER STORAGE OF THE ENGINE

1. When the boat has been beached, the cooling water should be drained off at the plug in the bottom of the cylinder (se fig. 1 and fig. 4).
   When all the seawater has run out, refit the drain plug.
2. Remove the suction hose from the cooling water pump at the bottom cock and put the hose into a bucket with freshwater.
   Start the engine and top up the bucket as the engine uses the water.
   The engine is run for 5-10 min. at moderate RPM.
   Never put water pressure from hose direct to the cooling water pump.
3. When the engine has been stopped, unscrew the cover of the cooling water pump and remove the rubber impeller and store it separately during the winter. At the same time it should be checked that there is not any formation of cracks in the impeller.
   Drain the water off again in the bottom of the cylinder.
4. Drain off the lub. oil or pump it out with the oil bilge pumpe.
   Fill the engine with approx. 0.5 ltr. clean engine oil and turn this with the starter motor and activate the decompression until the oil warning lamp turns off.
5. Take the battery home and store it in a warm and dry place.
   Fill up the battery during the winter and charge it every second month approximately.
6. Remove the rubber plug beside the fuel nozzle (fig. 1, pos. 3 and fig. 4, pos. 1) and pour 2 tbs. of engine oil through the opening while the engine is turned slowly to the right with activated decompression.
   Then release the decompression handle and turn the engine against compression.
7. All bright surfaces, moving parts and electrical connections as well as the thread for the drain plug should be trated with grease free from acid.
8. Drain off the water, if any, from the fuel tank and fill it up with gas oil.
9. Drain off the oil from the saildrive (DV 10 L SME) at the delivery screw in the bottom under the propeller (see fig. 22, page 19).
   Fill with clean Hypoid gear oil SAE90 to the upper mark on the dipstick (0.4 ltr.).

DRAIN plug 14 MM

AT BACK of engine

RECONNECT MufflerHose

RECONNECT ½ HOSE

INSTALL Breather

IMPeller NOTE SCRATCH Line on HOUSING for ALIGNMENT

IMPeller INSERT DIMPle UP

REMOVE EXHAUST HOSE

PREPARATION OF ENGINE BEFORE LAUNCHING IN SPRING

1. Fit the rubber impeller of the cooling water pump and screw on the cover with gasket.
2. Fit cooling water drain plug.
3. Fill the engine with lub. oil until the upper mark on the dipstick.
4. Refit the starting battery and treat the terminals with grease free from acid.
5. Check the zinc anode on the sail drive and replace it if necessary.
6. Turn the engine manually through the compression without operating the decompression lever in order to make sure that there is not more oil in the cylinder than it can hold.
7. Check that the primer on the leg is intact before it is coated with anti-fouling (DV 10 L SME).
8. Check the stern tube stuffing box and fill it with stern tube oil (DV 10 L ME).
9. Check that there is electric contact from zinc anode (external) via stern tube to engine (DV 10 L ME).

GALVANIC CORROSION

To avoid corrosion of the propeller due to galvanic action it is advisable to fit a sacrificial zinc anode on the outside of the hull. To obtain a high degree of protection, electrical contact between sacrificial zinc (anode) and propeller (cathode) has to be established. This is obtained by fitting the sacrificial zinc and connecting electrically, as shown on fig. 30.

For the DV 10 L ME a sacrificial zinc of BERA 2B type is recommended. The sacrificial zinc must not be painted or be otherwise insultated, as this will prevent the zinc from corroding.

The sacrificial zinc must be checked every time the boat is ashore, or at least twice a year.

If the corrosion turns out to be very heavy, bigger anodes, e.g. 2pc. BERA 2B or 1pc. BERA 1, should be fitted. If there is no corrosion, check the electrical connections.

A good way of fitting the sacrificial zinc is to fold down one of its flaps and to clamp it to the stern bearing by means of a rustproof clip as shown on the sketch.

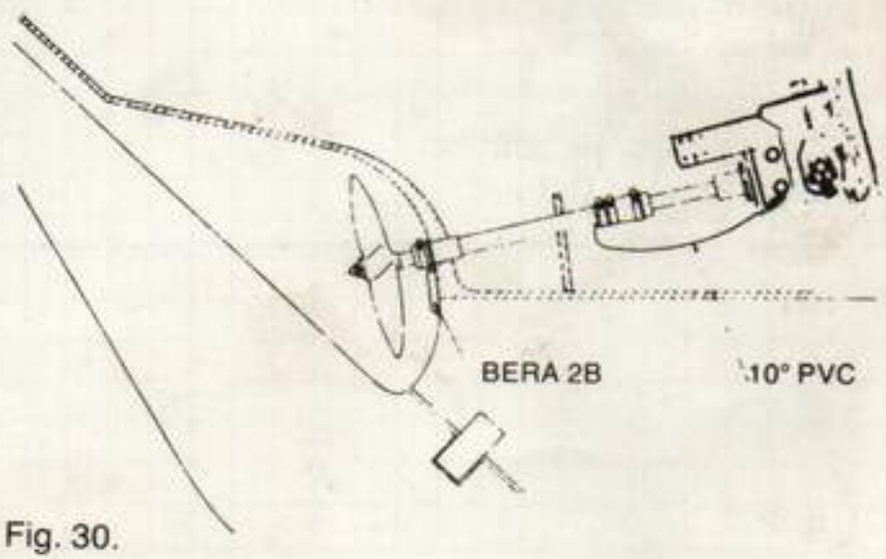


Fig. 30.

Maintenance Table

	Every 25 hours	Every 100 hours	Every 200 hours	Every 600 hours	At each annual launching
Check:					
Engine oil level	×				×
Oil level in gearbox or S-drive	×				×
Liquid level of battery	×				×
Stern tube lubrication (ME)	×				×
Nozzles				×	
Valve clearance				×	
Change:					
Lubricating oil		×			×
Gear oil (BW3)			×		×
S-drive oil			×		×
Fuel filter			×		
Clean:					
Fuel lift pump filter			×		
Vacuum valve		×			
Air filter			×		
Oil filter element		×			
Oil sump and oil suction filter				×	
Water separatot (if fitted)		×			

Analysis of Irregularities

Irregular operation / Cause	Vacuum valve does not function	Clearance in piston pin too big	Run in the engine	Wrong fuel	Leaking fuel oil pipe	Dirty oil sump	Oil pump worn out	Fuel filter choked	Empty fuel tank	Water in fuel tank	Oil level too low	Defective thermostat	Cooling water impeller defective	Valve guide worn out	Piston seized	Cylinder worn out	Rocker arm clearance too big	Governor spring damaged	Valve sticking	Fuel suction pipe choked	Wrong injection timing	Fuel pump worn out
Engine does not start				•	•				•							•			•	•		
Engine starts – but stops again					•			•		•					•				•		•	
Too small output (HP)								•							•	•			•	•		•
Lub. oil pressure too low						•	•				•											
Noisy		•															•		•			
Blue smoke (idling)	•		•											•		•						
Black smoke (at load)																						
White smoke (at full load)								•	•											•	•	
Engine knocks in crankcase																						
Engine knocks in cylinder head		•		•															•		•	
Revolutions uneven																		•				
Large consumption of lub. oil	•		•											•		•						
Lub. oil level increases																						•
Leaking for lub. oil	•																					
Leaking oil filler cap	•																					
Lub. oil in exhaust			•																			
Lub. oil in inlet																						
Engine too warm (cooling water)												•	•		•						•	
Irregular ignition					•					•												
Engine cannot be turned															•				•			
Engine cannot reach max. RPM								•							•			•		•		

Irregular operation / Cause	Fuel pump seized	Fuel pump pressure valve defective	Inlet valve clearance incorrect	Nozzle does not atomize	Nozzle holes clogged up	Leaky oil gaskets	Oil level too high	Exhaust valve burnt	Connecting rod bearing seized	Overload	Control mechanism heavy	Cooling water system blocked	Fuel tank bleeding blocked	Over-pressure valve/seat defective	Main bearing worn out	Toothed bar in fuel pump sticks	Piston rings worn out	Lift pump defective/filter dirty	Air in fuel system	Battery run down	Elect. connections defective	Fuel pressure pipe cracked
Engine does not start	•	•	•	•	•											•	•		•	•	•	
Engine starts – but stops again	•				•			•					•					•				•
Too small output (HP)		•		•													•	•	•			
Lub. oil pressure too low									•					•	•							
Noisy																						
Blue smoke (idling)							•										•					
Black smoke (at load)										•												
White smoke (at full load)				•	•														•			
Engine knocks in crankcase									•						•							
Engine knocks in cylinder head																						
Revolutions uneven	•										•					•						
Large consumption of lub. oil						•	•										•					
Lub. oil level increases	•																•					
Leaking for lub. oil						•																
Leaking oil filler cap							•															
Lub. oil in exhaust																	•					
Lub. oil in inlet			•																			
Engine too warm (cooling water)												•										
Irregular ignition		•																				
Engine cannot be turned									•													
Engine cannot reach max. RPM	•									•			•			•			•			

TECHNICAL DATA

Engine type	**DV 10 L SME**		**DV 10 L ME**
Working principle		4-stroke	
Number of cylinders		1	
Arrangement of cylinder	horizontal		vertical
Bore		85 mm	
Stroke		85 mm	
Cylinder volume		0.482 litres (dm^3)	30 C.I.
Compression ratio		18.4:1	
Compression pressure		47 bars	270 PSI
Output (DIN 6270B)			
Max. continuous HP at 50 r.p.s. (3000 RPM)		7.4 kW (10 HP)	
Max. continuous HP at 40 r.p.s. (2400 RPM)		6.2 kW (8.4 HP)	
Max. torque at 35 r.p.s. (2100 RPM)		24.5 Nm (2.5 kgm)	18 FT/LBS
Direction of rotation: seen from flywheel end		clockwise	
Idle RPM minimum		15-17 r.p.s. (900-1000 RPM)	
Idle RPM maximum		53 r.p.s. (3150 RPM)	
Inclination, max. aft	5°		18°
Inclination, max. ahead	20°		18°
Heel, max.	25°		25°
Valve Travel and Injection Timing			
Diameter of flywheel		294 mm	
Inlet valve: opens		12.5° before TDC (arc measure: 32 mm)	
Inlet valve: closes		50° after BDC (arc measure: 128.3 mm)	
Exhaust valve: opens		53.5° before BDC (arc measure: 137.3 mm)	
Exhaust valve: closes		10° after TDC (arc measure: 25.7 mm)	
Valve clearance (cold engine)		inlet 0.20 mm exhaust 0.25 mm	
Weight, net.	80 kg	- (176 LBS)	80 kg
Ratio (engine-propeller): ahead	1.75:1		2.47:1
: astern	1.75:1		2.27:1
Placing of engine number		on cranckcase at starter motor	

BUNK FUEL FILTER Part # 620 L 0618

	DV 10 L SME	DV 10 L ME
Fuel system		
Combustion system	direct injection	
Injection pressure (with CIPA-pump)	220-230 bars	
Injection pressure (with BOSCH-pump)	205-215 bars	
Injection timing	27° ± 1° before TDC = arc measure on flywheel: 69.5 mm	
Injection timing	27° ± 1° before TDC = piston before TDC 5.9 mm	
Duration of injection	15° = 38 mm arc measure on flywheel	
Nozzle tip outside cylinder head	min. 4 mm – max. 4.5 mm	
Nozzle	BOSCH or CIPA VH 160-57	
Fuel injection pump	BOSCH or CIPA	
Fuel lift pump	AC CORONA	
Fuel filter	UNIVERSAL FILTER ITALIANA S.A.	
Quality of fuel	BS 2869, Class A	
Lubricating Oil System		
Engine:		
System	Full-flow wet sump lubrication	
Oil pump type	EATON	
Lub. oil pressure (warm engine at 3000 RPM)	2.5-4 bars	
Min. lub. oil pressure (warm engine at 1000 RPM)	1.5 bars	
Lub. oil filter	Mesh filter which can be cleaned	
The lub. oil quality should meet	A.P.I. spec. CC or CD and/or MIL-L-46152	MIL-L-2104C
Lubricating oil viscosity:		
at air temperatures:	below 0°C: SAE 10 W 0°-+15°C: SAE 20 W +15°-+30°C: SAE 30 above +30°C: SAE 40 or 0°-40°C: SAE 15W40	
QUANTITY		
Lubricating oil quality; incl. filter	2.0 litres	
Gear		
Lub. oil quality S-drive	Hypoid gear oil SAE 90	
Lub. oil quality BW3		Same as for engine
Lub. oil viscosity BW3		SAE 30
Lub. oil quantity	0.4 ltrs.	0.35 ltrs.

OIL QUALITY

Cooling System

System	DV 10 L SME	DV 10 L ME
System	direct seawater	
Cooling water temperature (thermostat-controlled)	50°-70°C	
Thermostat	Wahler 7092-60°C-±2°C	
Cooling water pump	Johnson F 35B-9 (10-35118-1)	
Pump capacity at 3000 RPM on engine	10-12 ltrs./min. (120-170 GPH)	
Pump counter pressure (manometric)	max. 0.6 bars	
Pump suction pressure (manometric)	max. 0.3 bars	

Electrical System

Battery voltage	12 volts
Battery capacity	88 Ah
Starter motor	PARIS RHONE – D9E50 (10.112R)
Starting output	1.3 kW (1.8 HP)
Charging generator (flywheel-mounted, alternating current)	SAPRISA 6273
Charging voltage (at 20°C)	14.2 ±0.2 volts
Charging output	210 W (15 AMPS)
Stop solenoid	BOSCH 0.330.101.024

Torques

Stay bolts (cyl. cover)		7 kpm – 50 Ft/LBS
Connection rod screw		4 kpm – 29 " "
Flywheel nut		18 kpm – 130 " "
Nozzle holder in cyl. cover		2.3 kpm – 17 " "
Nut for flexible coupling		6 kpm – 44 " "
Screws for S-drive leg to engine	4.2 kpm	
End covers towards engine block		2.3 kpm – 17 " "
Oil sump towards engine block		0.8 kpm – 6 " "