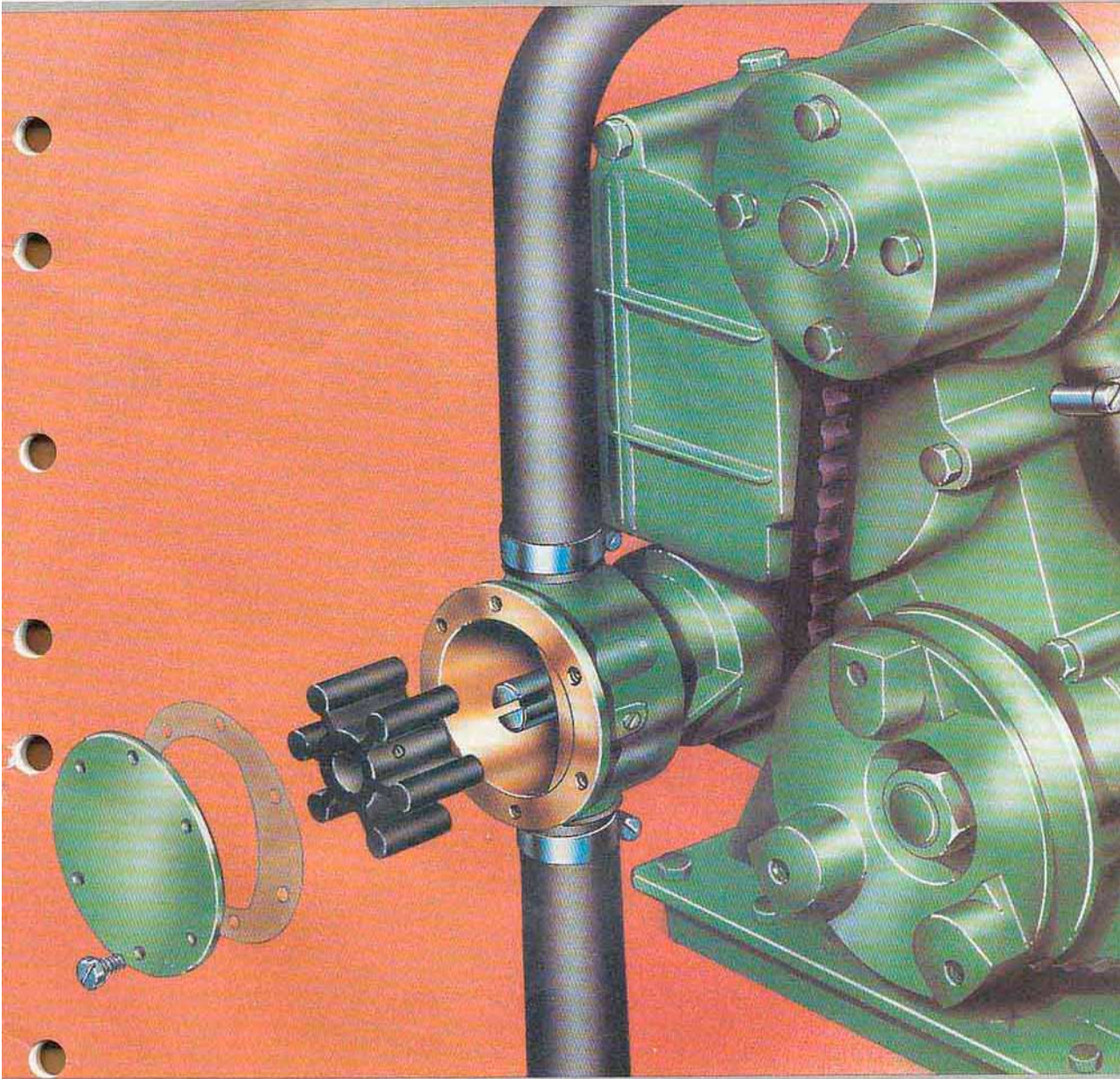
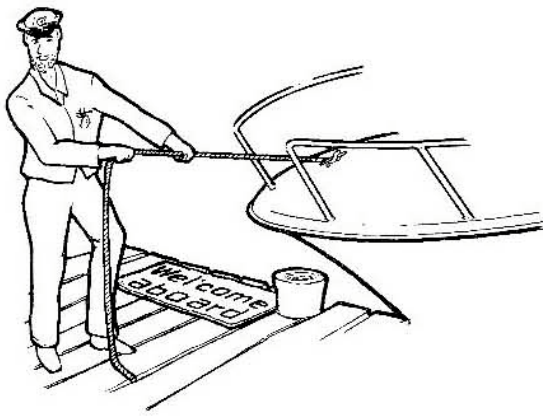


“Do it yourself” manual

MD2010, MD2020, MD2030, MD2040



**VOLVO
PENTA**



Introduction

Many boat owners prefer to look after their boats and equipment themselves since for many people, their boat is not just something to travel in, it is also a pleasurable leisure activity.

Security and safety aboard depend to a large extent on the condition in which the equipment on the boat is in. For reliable operation, the engine is the most important link. This maintenance manual describes how to look after the engine, and the book is divided up as a "do-it-yourself" manual, with descriptions of the functions of various systems, e.g. the cooling system.

The tasks to be performed for each job are described in detail, with both text and illustrations. The tools needed are also specified, which has the practical advantage that you can read through the job at home, before you start. The tools needed for each task and any spare parts can be purchased beforehand, before you drive out to your boat.

The jobs described are at the level which we feel that a reasonably handy boat owner should be able to do safely. Each person has their own background of knowledge and education, from work experience, training etc. For this reason, the degree of difficulty found in doing the jobs described in this "do-it-yourself" manual can vary from person to person. If you feel at all uncertain about any point, ask your nearest authorised Volvo Penta service station. The personnel will willingly help you with advice, and will look after any points you may need help with.

Even if you are an experienced craftsman, all the more difficult jobs should be given to an authorised Volvo Penta service station to do. These jobs often require special tools and workshop manuals to do in a safe manner. Work on the injection pump and injectors should always be given to an authorised workshop which has the very expensive special tools and training required.

During the guarantee period, it is important that an authorised Volvo Penta service station should do any guarantee work, to avoid the risk of invalidating the guarantee.

Important

The following warning signs appear in the "Do-it-yourself" manual and on the product.



WARNING! Warns you for the danger of personal injury, major damage to products or property, or that serious malfunctions can occur if the instruction is not followed.



IMPORTANT! Is used to call attention to things which can cause personal injury or serious malfunctions in products or property.

NOTE! Is used to call attention to important information to facilitate service tasks or operation.

Spare parts

The product you have chosen is designed to withstand a rough life at sea, as all Volvo Penta products are, and to last for a long time. All components are designed and engineered to join forces in doing this job.

For you to get the optimum safety and service life built in, it is of the greatest importance that you always choose **Volvo Penta Original Spares**. Do not fall for the temptation of installing "pattern" spares. It is a very short-sighted investment which can ruin the overall quality and safety of your engine. Invest in quality at sea, which we always have done at Volvo Penta.

Environment

All of us want to have a clean marine environment for rest and relaxation. Mankind, as well as all other living things, depends on a supply of clean air, clean water and peace.

Unfortunately, the marine environment is threatened in various ways. The cleanliness of the air and water, and the quiet peace, are affected by human activity in and near to the water.

In our product development, we give priority to development which makes our products as environmentally friendly as possible. We work continuously on cutting exhaust emissions, fuel consumption and noise levels.

It is however you, as the boat owner, who eventually decides how you influence the environment by running the engine on the recommended fuel and in the manner advised in the owner's manual.

It is of great importance that the annual service really gets done. For some jobs, authorised service personnel need to be used.

In many of the tasks described, components need to be changed. Used oil and fuel filters always contain residues of oil or fuel, and should be put in the special collection bins found at service and recycling stations, together with other chemicals and worn-out batteries. Volvo Penta recommends that you should use biologically degradable degreaser and if possible, mechanical cleaning instead of poisonous hull paints.

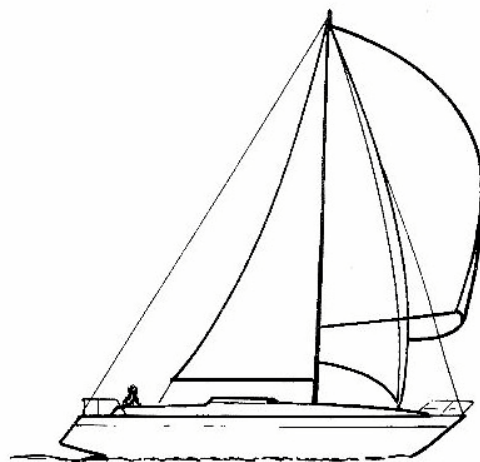
By responsible behaviour as a boat owner and helmsman, you will make a very valuable contribution to preserving the marine environment.



Thank you

Volvo Penta introduced its first marine engine in 1907. Quality, reliability and innovation have made Volvo Penta a world leader in the marine engine industry. No product is better than the service and maintenance it gets, however. We know from customer correspondence that it is not at all unusual that 20-30 year old Volvo Penta products are still in as-new condition. This is because their owners have carefully looked after and cared for their Volvo Penta products. All of us at Volvo Penta are proud of the publicity this gives us. Naturally, we hope that you will also get many years of trouble-free service from your Volvo Penta product.

We hope you enjoy your "Do-it-yourself" sessions and many hours of pleasurable boating thereafter.



AB VOLVO PENTA
Technical Information

Maintenance Manual

MD2010 • MD2020 • MD2030 • MD2040

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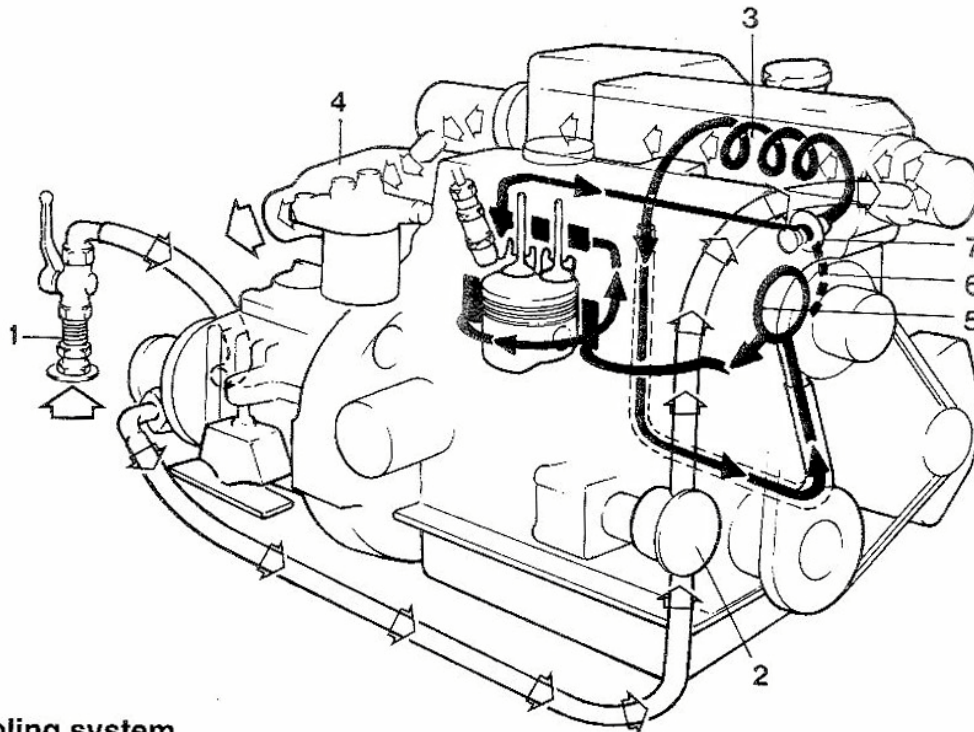
Cooling system

The cooling system of the engine is divided up into two units, a seawater system and a fresh water system.

The sea water system receives water via the reversing gear or sailboat drive, the water flow is driven by a seawater pump at the front of the engine.

The water often passes through a seawater filter installed inside the boat, which stops seaweed and other particles that could otherwise block the cooling ducts inside the engine. The sea water then passes through the heat exchanger, when it cools the fresh water in the internal system of the engine. The sea water then passes out via the exhaust riser, where it is mixed with the exhaust gas.

In the fresh water system, which is the internal cooling system in the engine, water circulation is driven by the circulation pump at the front of the engine. The circulation paths inside the engine are controlled by the thermostat in the thermostat housing. During the warming up phase, the thermostat is shut and the water does not pass through the heat exchanger, which allows the engine to heat up quickly. As soon as the engine reaches its correct operation temperature, the thermostat opens and the water passes through the heat exchanger.



Engine cooling system

Open arrow = Seawater system

Black arrow = Fresh water system

Cooling system components

- 1 Water inlet
- 2 Sea water pump
- 3 Heat exchanger
- 4 Water cooled exhaust riser
- 5 Circulation pump
- 6 By-pass
- 7 Thermostat



Thermostat housing

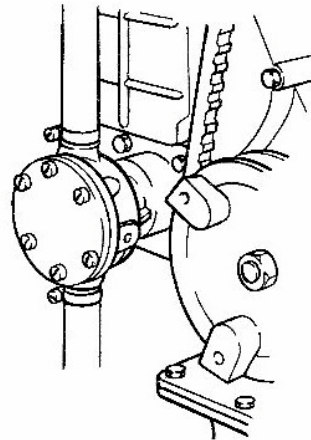
The engine temperature is regulated by a thermostat, located in the fresh water system of the engine. When the thermostat is open (hot engine), the water passes through the heat exchanger. When the thermostat is closed (cold engine), the water by-passes the heat exchanger, for quick warm-up. The opening temperature is noted in the engine owner's manual.

Sea water pump

The seawater pump is fitted to the front of the transmission housing and is directly driven by the transmission, via a gear wheel.

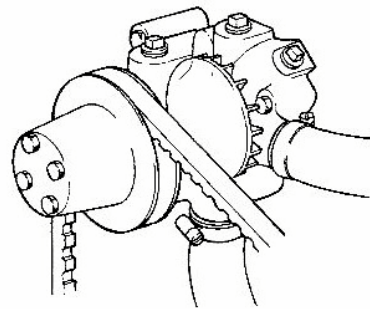
The drive shaft runs on ball bearings, and the pump housing is sealed from the transmission by means of seal rings.

The pump wheel, often referred to as the impeller, is made from neoprene rubber. It is very important that the pump is never operated without the water being turned on. The heat caused by friction would otherwise build up so high that the impeller would quickly be destroyed.



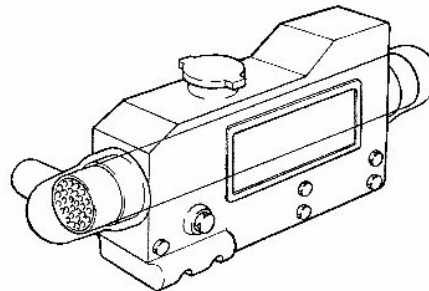
Circulation pump

The circulation pump at the front of the engine is belt driven. The pump has a turbine wheel mounted on a shaft with ball bearings. The seal in the pump housing consists of a ceramic seal.



Heat exchanger

The heat exchanger, which is of the tubular type, is cooled by sea water. Together with the thermostat, it keeps the operating temperature of the engine within the given limits. When necessary, it can be taken to pieces for cleaning.



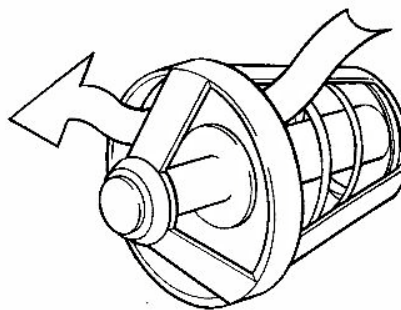
Thermostats

There is one (1) thermostat in the cooling system, which regulates the temperature of the cooling water in the engine.

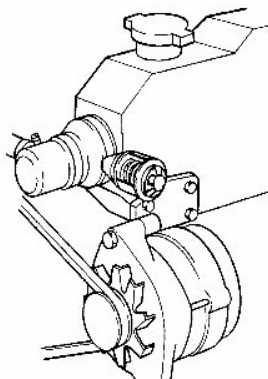
If the engine runs too hot or too cold, the reason could be that the thermostat opens at the wrong temperature or that it does not open at all. Other possible reasons are a fault in the temperature sensor or instrument, a blocked sea water filter or sea water inlet, a faulty impeller, not enough coolant, air locks in the fresh water system or a blockage in the cooling system.

The thermostat location varies, depending on engine type. The location is shown in the adjacent illustrations.

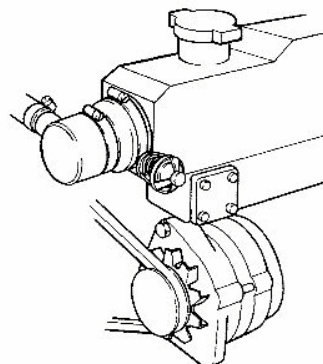
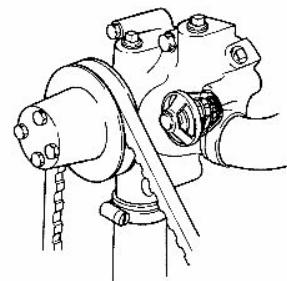
MD 2010, MD 2020. The thermostat is located between the exhaust pipe and the cylinder block. The exhaust pipe must therefore be removed when the thermostat is to be changed or inspected.



MD 2030. The thermostat is located between the circulation pump housing and the cylinder block at the front of the engine. The circulation pump must therefore be removed when the thermostat is to be changed or inspected.



MD 2040. The thermostat is accessible above the square lid at the lower front corner of the exhaust pipe.



Changing the thermostat

Before the thermostat can be removed, about half of the coolant must be drained off. Save the coolant, it can be put back again when the job is finished. The owner's manual provides information about where the drain cocks are, and how much coolant each engine needs.

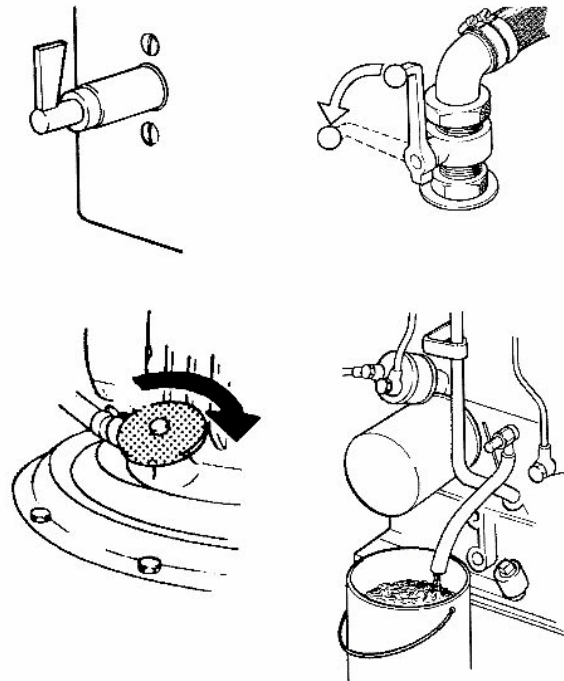
Turn the main switch off.

Shut the sea cock on the hull inlet or the sailboat drive sea water inlet cock.

⚠ WARNING! Never leave the boat until you are sure that water can not find its way in under any circumstances and sink the boat, because of faulty sea cocks etc.

NOTE! Do not forget to open the sea cock when the job is finished, or before the engine is started.

Carefully study how all the components are fitted before you start, to aid re-assembly.

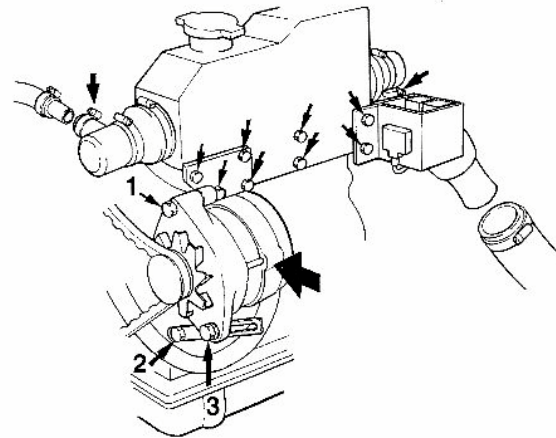


Removing the thermostat, MD 2010, MD 2020.

Undo the coolant hose which comes from the seawater pump, by the rubber housing at the front of the heat exchanger.

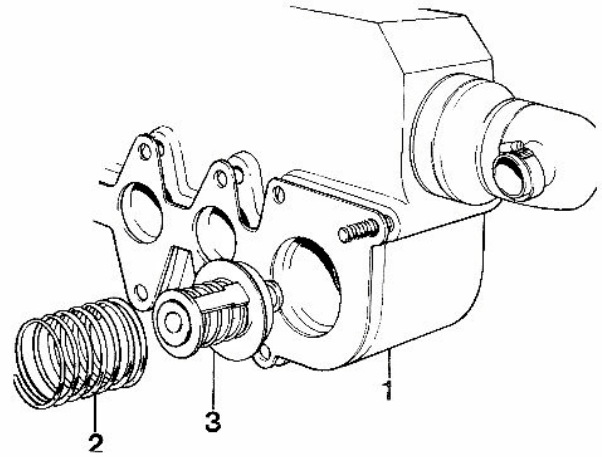
Also undo the exhaust hose from the exhaust riser. Make sure that water can not find its way into the boat via the exhaust hose. For safety's sake, lift up the mouth of the hose so high that it comes above the waterline.

Undo screws 1, 2 and 3. Loosen the alternator drive belt by pressing the alternator in against the engine block.



The screws which hold the alternator bracket and electrical distribution box in place also hold the expansion tank/heat exchanger/exhaust pipe (1). Be careful when you take the screws out, the entire package is now loose and is quite heavy. Do not allow it to fall unchecked since the alternator could be damaged.

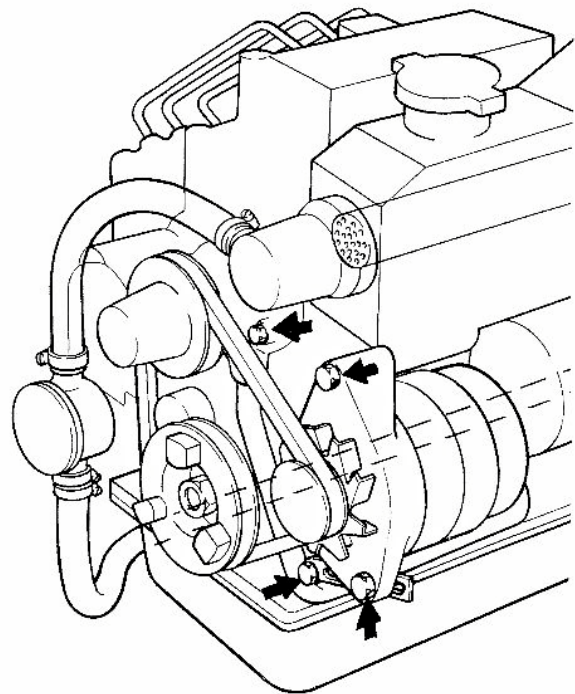
The thermostat (3) and the large spring (2) are now loose and can be removed. The large gasket must be removed and replaced by a new one when everything is installed again.



Changing the thermostat, 2030

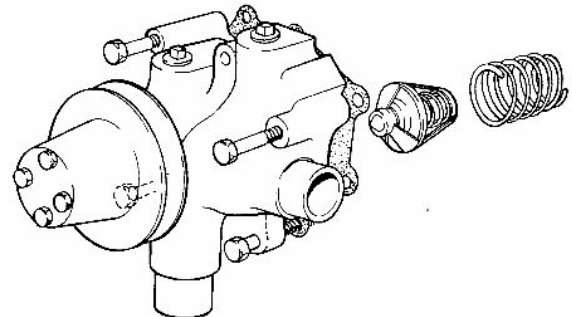
Loosen the alternator drive belt and press the alternator in towards the engine block.

Remove all the screws which hold the circulation pump in place, including the tensioner strap.



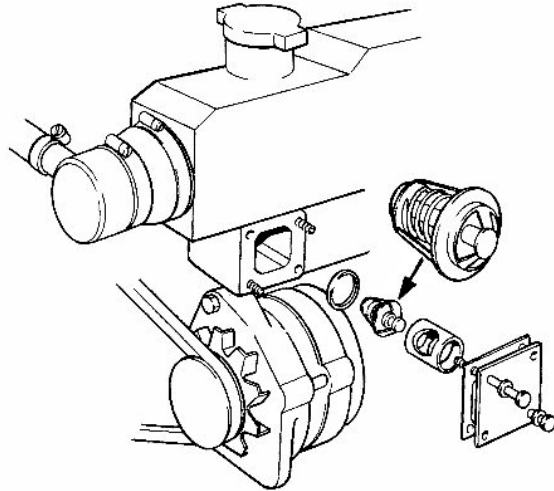
Pull out the circulation pump so far that the thermostat and its spring can be removed. If necessary, the hoses on the circulation pump can be undone.

The gasket between the circulation pump and the adaptor plate at the front of the engine plate must be changed before installation. If the adaptor plate also comes loose during removal, the gasket between the plate and the engine block must also be changed.



Removing the thermostat, 2040

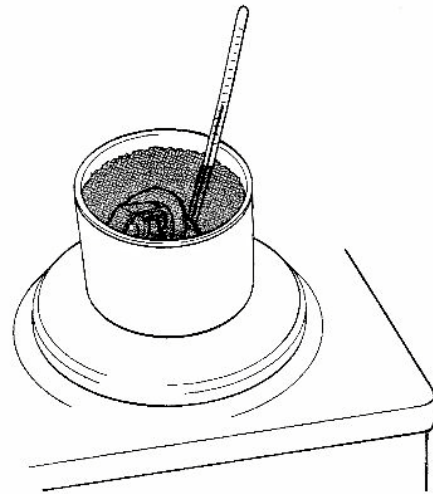
Undo the four screws on the thermostat housing lid. Remove the lid, gasket, spacer sleeve, thermostat and seal ring. The seal ring and gasket must be changed before re-installation.



Checking the thermostat

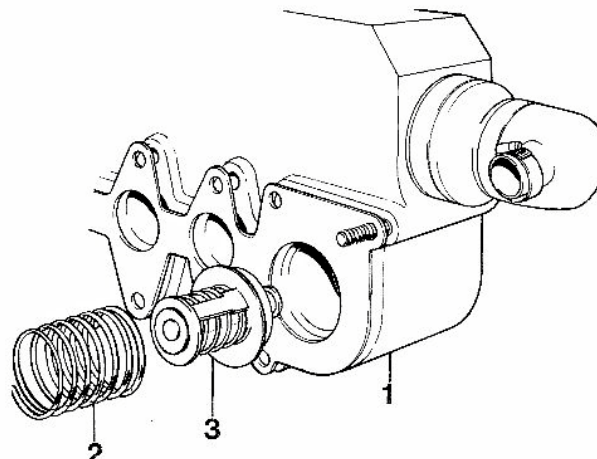
Check that the thermostat shuts fully. Heat up water in a vessel to a temperature of 68°C (2010, 2020) or 75°C (2030, 2040). Lower the thermostat into the water and check that the thermostat is still shut after at least 3-5 minutes.

Raise the temperature to boiling point (100°C) and check after 3-5 minutes that the thermostat has opened at least 6 mm (2010, 2020) or 8 mm (2030, 2040). Change the thermostat if it does not meet these requirements.



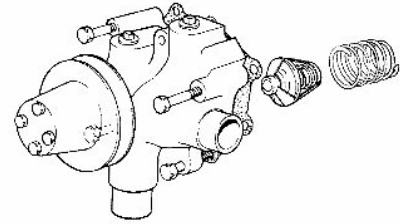
Installing the thermostat, 2010, 2020

Insert a couple of screws through the heat exchanger package (1), so that the new gasket can be hung on the screws. Put the thermostat (3) and spring (2) into the package at the same time as the package is lifted into place. Tighten the screws which hold the package (alternately), the alternator bracket and the distribution box. Tension the alternator drive belt and lock it in position (See "Inspection and replacement... page 25). Connect the coolant hose and the exhaust hose. Tighten the hose clamps. Put back the coolant which was drained off, and check the coolant level after the engine has run for a couple of minutes.



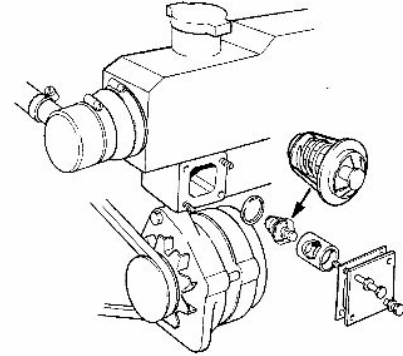
Installing the thermostat, 2030

Use new gaskets. Hold the thermostat and spring in place in the circulation pump housing at the same time as you put the housing into place. Tighten the screws holding the housing alternately, to make the tension as even as possible. Note that the alternator tensioner must be fitted to one of the screws. Tension the alternator drive belt and tighten the tensioner strap. (See page 25). Put back the coolant which was drained off and check the coolant level once the engine has been running for a few minutes.



Installing the thermostat, 2040

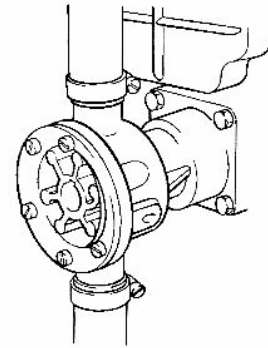
Use a new gasket. Fit a spacer sleeve, thermostat, gasket and lid. Put back the coolant which was drained off and check the coolant level once the engine has been running for a few minutes.



Sea water pump

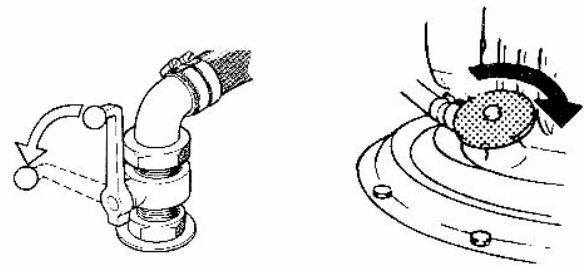
The component in the sea water pump which is most subject to wear is the impeller. What causes the wear is when sandy water or seaweed gets in and causes considerable stress on the wings.

An impeller which has been run without water can also have been so badly damaged that it has to be changed. Excessive water temperature can be caused by poor pump action.

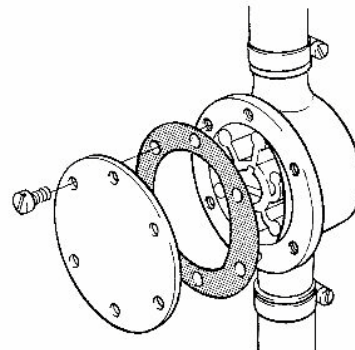


Before the lid on the sea water pump is removed, the water flow to the pump must be cut off. This is easiest and safest done by shutting off the sea cock on the hull, or for boats with a sail boat drive, by shutting the cock on the drive.

⚠ WARNING! Never leave the boat until you have assured yourself that the water can not find its way in under any circumstances, because of faulty cocks etc., and sink the boat.

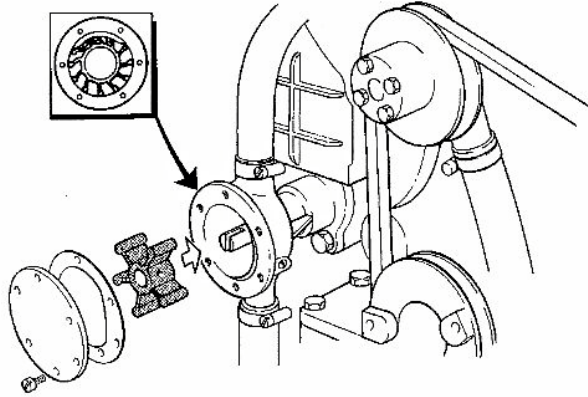


Undo the 6 screws on the lid. Remove the lid and gasket. Use a pair of water pump pliers to pull the impeller out from the housing. If the impeller is damaged in any way, it must be replaced. Also check that there is no contamination in the pump housing and its inlets or outlets.

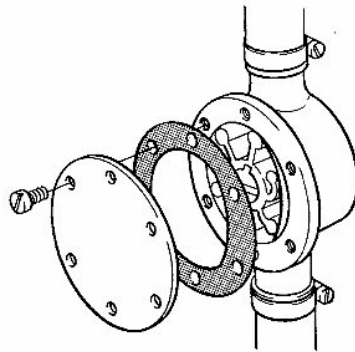


Install a new impeller, or the existing one, as follows:

Turn the impeller clockwise at the same time as you press it onto the shaft. The wings will then be bent the right way from the start.

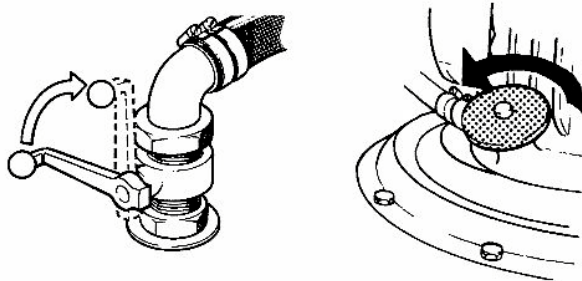


Always use a new gasket between the pump housing and the lid. Install the lid.



If the water flow to the sea water pump has been shut off, this must be opened before the engine is started.


After starting, check that there is no leakage.

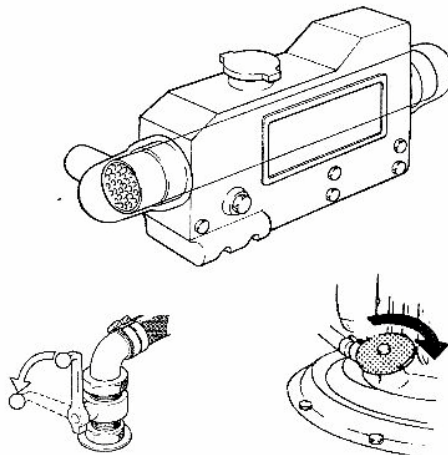


Heat exchanger, cleaning, 2010 - 2040

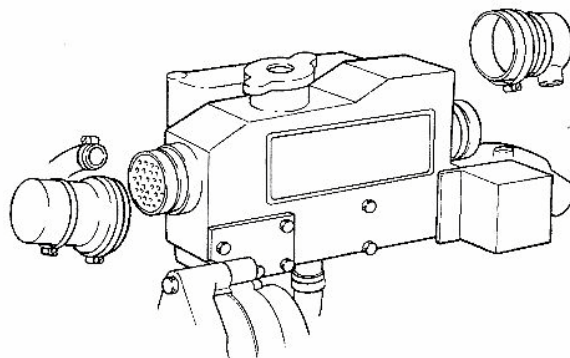
The heat exchanger is easily accessible for cleaning.

Before anything in the cooling system is undone, the sea water inlet must be shut off by closing the sea cock (on the hull). Drain the cooling system and save the coolant which should be put back when the job is finished.

 **WARNING!** Never leave the boat until you are sure that water can not find its way in under any circumstances and sink the boat, because of faulty sea cocks etc.



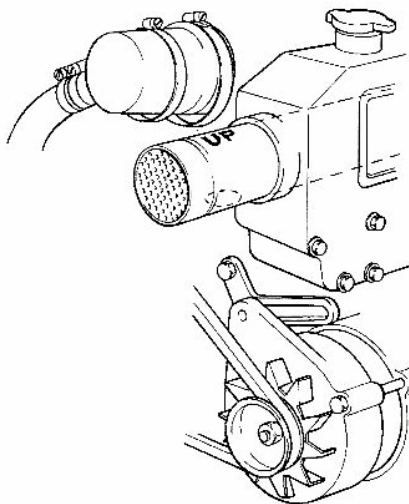
Undo the large hose clamps for the rubber housings. Pull the rubber housings away from the heat exchanger housing, and then pull out the tubular insert from the side which is easiest. The insert can now be inspected and the tubes cleaned. In stubborn cases, use a special heat exchanger cleaner and a cylindrical steel brush of 3 mm diameter.



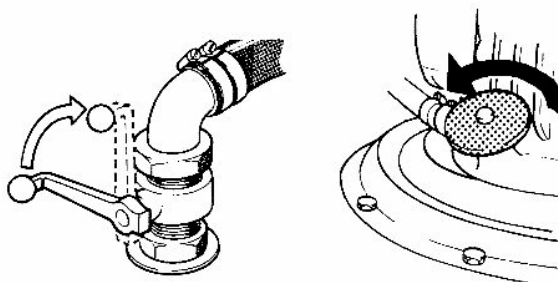
When the heat exchanger is re-installed, it should be turned so that the large holes point downwards and the small air bleed hole is upwards. The heat exchanger system is also marked "UP" to avoid incorrect assembly.

Slide the heat exchanger pipe in so far that it projects the same amount from both sides. Press the rubber hoses on and tighten the hose clamps. Connect hoses which have been undone.

Put back the coolant which was removed earlier. Check that the level is correct.



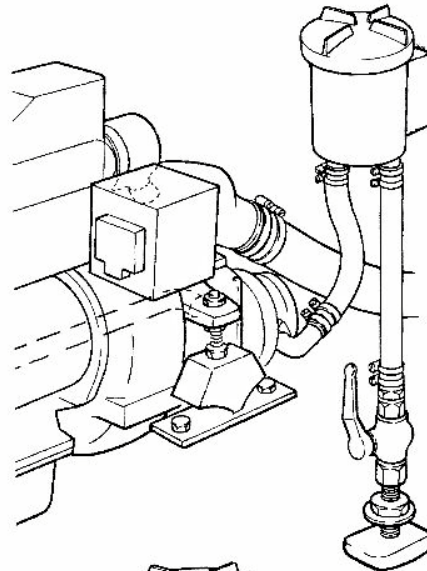
Open the sea water inlet cock.



Sea water filter, cleaning

If there is a sea water filter in the installation, it should be cleaned regularly. If no sea water filter is installed, we recommend that you should install one. This is available as a Volvo Penta accessory. The risk of getting the cooling system blocked is considerably reduced, this is a major risk if the boat often sails in shallow water with a lot of seaweed and other contamination. A blocked cooling system is frequently the reason for high engine temperatures.

The sea water filter is easy to clean. Unscrew the lid, remove the inner lid and pull the insert out.



Clean the insert, inspect it and clean the inside of the container when necessary. Put the insert back, which can only be installed one way round. The pipe on the inside of the wall should fit the corresponding indent in the insert. Then put the inner lid back with the handle upwards, lastly screw the outer lid on.

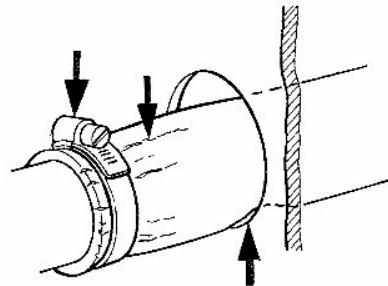


Coolant hoses

The coolant hoses are made of rubber. Rubber ages and can be subject to mechanical wear. So check regularly to ensure that the rubber does not feel hard or has cracked, and that the hoses do not chafe against sharp edges.

Replace damaged hoses.

Also check the hose clamps, to ensure that they are not damaged and that they are correctly located and tightened.

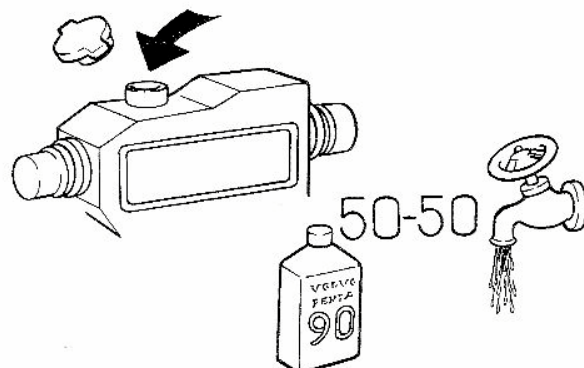


Conserving the cooling system

Please refer to page 29 for conservation.

Coolant

The cooling system should be filled with a corrosion-protecting glycol mixture. 50% glycol (Volvo Penta type 90) and 50% fresh water. As an alternative, a mixture of corrosion inhibitor and water can be used, but then there is no protection against frost.



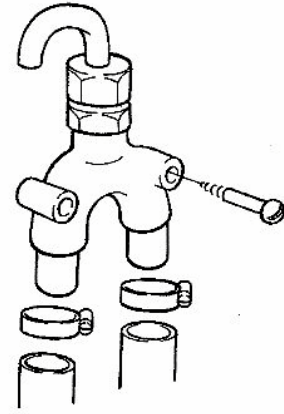
Vacuum valve

Sailing boats often have a vacuum valve.

The purpose of this valve is to prevent sea water from siphoning in to the engine and causing severe damage.

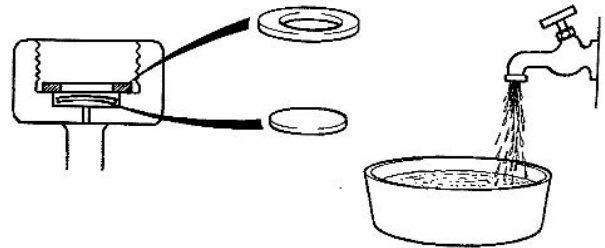
The vacuum valve must be looked after, this is best done during conservation or before longer lay-ups.

Undo the valve. Check that no water forces its way in when the boat is in the water.

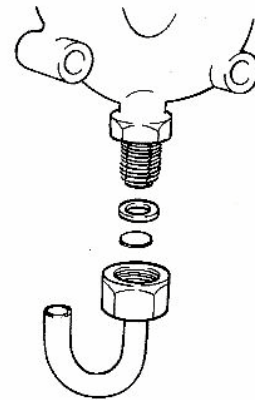


Unscrew the hexagonal lid. There is a diaphragm and a gasket in the lid. Clean all the components, turn the lid upside down and put in a diaphragm and a gasket, in that order.

To prevent the components from falling out or being damaged, the valve housing must also be held upside down during assembly.



Do not tighten the lid too hard (0.2 kpm / 1.4 ft.lbs). The valve could stop working otherwise.



Lubrication system

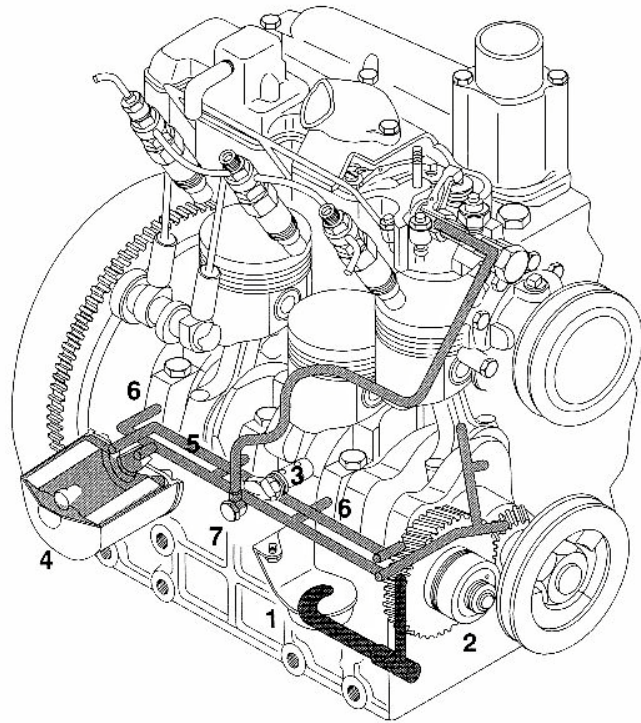
The engines have pressure lubrication systems, with a full-flow oil filter.

The oil pump is directly driven by the crankshaft. All oil passes the oil filter before it reaches its lubrication points.

A reduction valve, built into the system, keeps the oil pressure within the permitted limits.

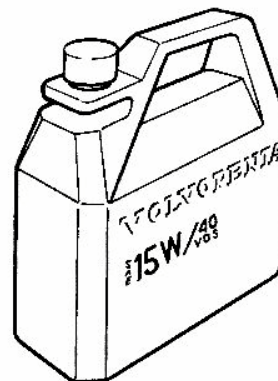
The oil filter has a built-in safety valve, which lets the oil pass if the filter gets blocked. Un-filtered oil will pass through to the lubrication points, which will cause rapid wear and consequent expensive repairs.

- 1 Oil strainer
- 2 Oil pump
- 3 Reduction valve
- 4 Oil filter
- 5 Main duct
- 6 Main bearing
- 7 Other lubrication points.



Oils

The service life of the engine depends to a large extent on ensuring that oil changes and filter changes are done in accordance with the instructions in the owner's manual. The oil grade is very important. Please refer to "Oils..." on page 51 for the correct oil grade.

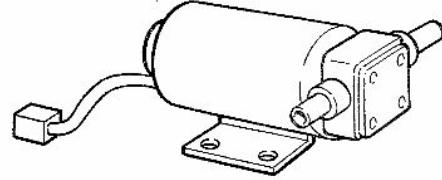
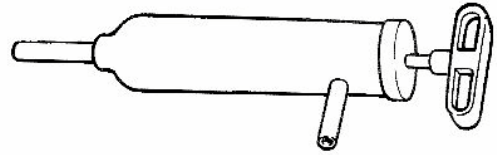


Changing the Engine Oil

Oil and filter changes are mainly done in conjunction with the winter lay-up.

It is easiest to drain the oil off when the engine has been warmed up. The oil is then fluid and has also been stirred, so that any particles have been stirred up from the bottom of the sump.

Oil drain pumps, which considerably facilitate oil draining, are available as Volvo Penta accessories. The pumps are available in both mechanical and electric versions.



⚠ WARNING! Hot oil can cause burns.

A special connection for draining oil is fitted to the starboard side of the engine. Remove the plug and connect the oil drain pump.

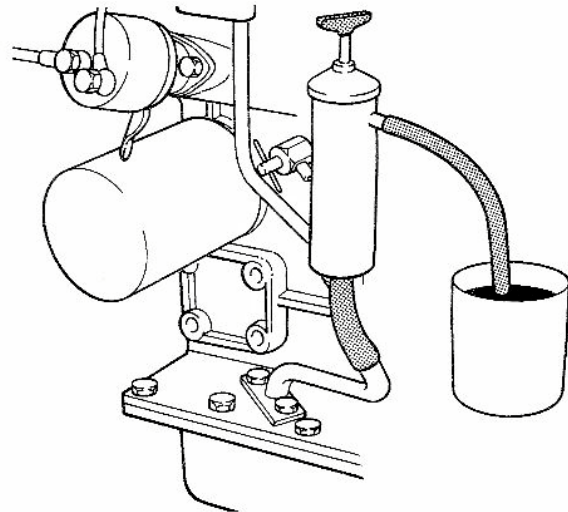
The oil volumes to be drained are:

2010 = app. 2 litre (2.1 US quarts)

2020 = app. 3.5 litre (3.7 US quarts)

2030 = app. 4.5 litre (4.7 US quarts)

2040 = app. 7.5 litre (7.9 US quarts)



⚠ Do not spill any oil, think of the environment and hand the oil in at a recycling station.

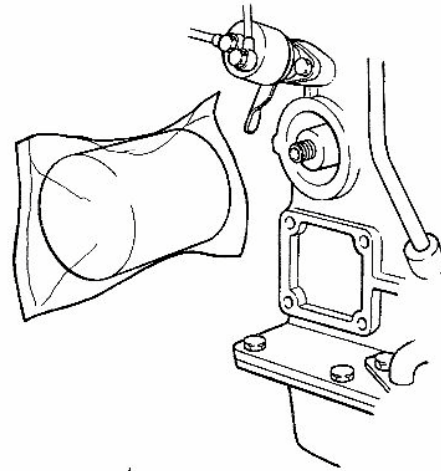
Oil filter change

It is a good idea to change the oil filter at the same time as the oil is changed, since it contains dirty oil.

⚠ WARNING! Hot oil can cause burns.

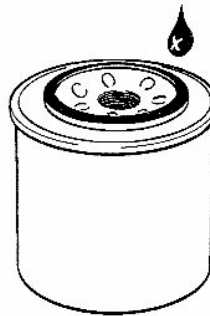
Before removing the oil filter, it is a practical idea to put a plastic bag around the filter, to avoid oil spillage in the boat.

The oil filter is easiest to remove with a special oil filter spanner. It is also possible to punch a screwdriver right through the filter and then turn it.

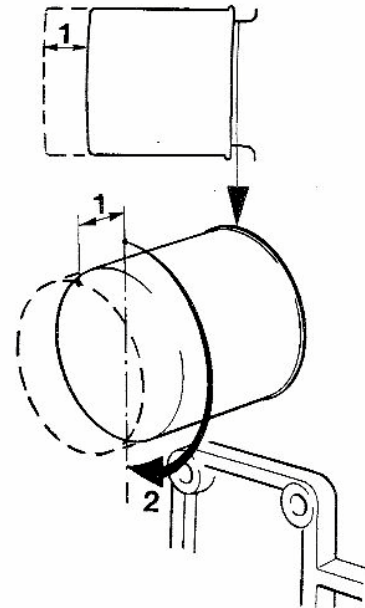


Hand the oil filter in to a re-cycling station, since it contains some oil which should not end up with ordinary domestic rubbish.

Wipe a few drops of oil on the rubber gasket of the new filter. Clean the mating surface on the engine.

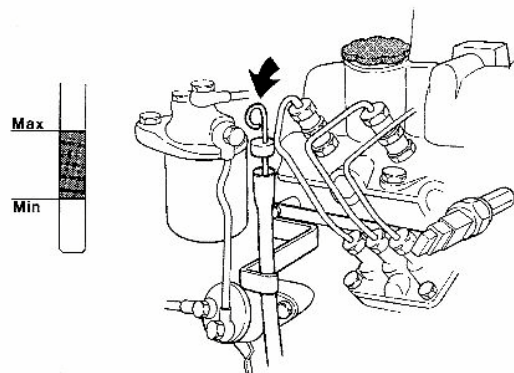


Tighten the oil filter **by hand** (1) until it contacts the mating surface. Then tighten the filter **by hand** (2) a **further ½ turn, not more!**



Fill up with oil (CD15W/40) to the correct level on the dipstick. Start the engine and check at once that the oil pressure failure alarm stops right after starting. Also check that there is no oil leakage around the oil filter.

Stop the engine and top up with the amount of oil missing.



Changing the reversing gear oil

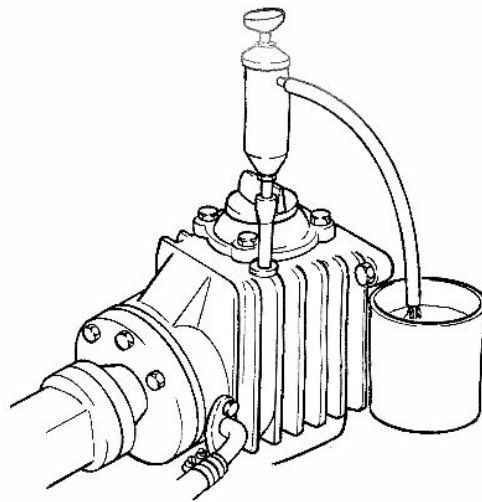
It is a good idea to change the oil in the reversing gear at the same time as you change the engine oil, since the oil is still hot.

⚠ WARNING! Hot oil can cause burns.

Remove the dipstick. The oil can then be sucked up through the dipstick hole.

Put a hose on the oil drain pump, long enough to reach down to the bottom of the reversing gear. Take a vessel to receive the oil, with a capacity of about 1 litre (1.05 US quarts). Pump all the oil out.

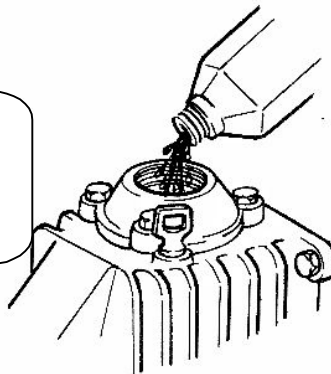
Hand the oil in to a re-cycling station.



Remove the large black plastic plug and top the reversing gear up with about 0.8 litre (0.84 US quarts) of the same grade of oil as is used in the engine, i.e. ~~CD 15W/40~~.

Top up to the right level.

Note: newer saildrives use GL5 75w90, not engine oil



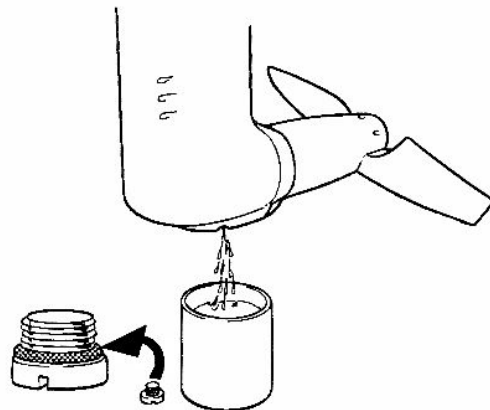
Changing the oil in the sail boat drive

The oil can only be changed when the boat is laid up on shore. If the engine has been warmed up before the boat was taken up, the oil will run out easier.

⚠ WARNING! Hot oil can cause burns.

Undo the drain plug in the lower section of the drive and let the oil run out into a suitable container. Check that the O-ring on the drain plug is undamaged. Wipe off round the oil drain hole, install the plug with O-ring and tighten.

Hand in the oil collected to a re-cycling station.



Remove the large plastic plug and fill app. 2.8 litre (2.95 US quarts) of oil of the same grade as used in the engine, i.e. ~~CD 15W/40~~. **GL-S 75W90**

Check the oil level. If it is too high, it must be lowered and if it is not high enough, it must be raised. Check the oil level again when the boat has been launched and the engine has been run for a short while.

