

# **OWNER'S MANUAL**

**AD31/41, TMD31/41, TAMD31/41  
KAD42, KAMD42**

**VOLVO  
PENTA**

## Welcome on board!

You have chosen a boat with all the comfort you could ever wish for, and an engine with maximum safety which will be extremely economical to run. We welcome you to our worldwide service network.

## Read this before you cast off from shore

We advise you to read through this Operator's Manual even if you are used to the sea and have previously piloted various types of boat. Some things may be different to what you are used to.

## Warranties and Service

Provided with each engine is a description of the warranty we issue for our product. The warranty card you receive should be filled in and returned to VOLVO PENTA by your sales representative; this is important both for us and for you. Make sure this is done, because we may refuse to undertake repairs on the warranty because the date of delivery cannot be verified.

Some markets have other warranty conditions which replace or supplement the VOLVO PENTA international warranty.

## Fuel

Use "Autodiesel" diesel oil. An inferior fuel may cause breakdowns.

## Lubricating oils

Use only lubricating oils of the quality recommended in "Technical Data".

## Maintenance

There are a number of maintenance instructions listed in this Operator's Manual. If these are not carried out in good time, your engine may become less reliable and less economical to run as a result. Contact an authorised VOLVO PENTA workshop if you are unable to carry out the prescribed maintenance yourself.

It is important that you always use original parts in order to maintain VOLVO PENTA quality. It will be worth it in the long run. VOLVO PENTA has developed an extensive network of retailers in order to be able to provide services and parts.

Always state the complete type designation and serial number when ordering parts.

## Safety instructions



When you see this symbol before an item of text, it means that there is a danger of injury or damage unless the instructions are followed.

## Maintenance Manual

This Owner's Manual contains brief maintenance instructions in the form of an operating schedule containing text and illustrations.

For the "Do-it-Yourself" we have put together a more comprehensive **Maintenance Manual** which also describes the various systems, e.g. the cooling etc. in more detail. The Maintenance Manual also provides hints on the tools you will need.

The Maintenance Manual can be obtained from your VOLVO PENTA retailer.

## Safety

### Preparations

We have put together the checklist below (to which you can, of course, add your own notes) so that you may enjoy trouble-free sailing.

It is, of course, important that the engine, its equipment and the boat in general are maintained according to the instructions given.

### Travel plans

- Do you have a current nautical chart for the planned voyage?
- Have you calculated the distance and the amount of fuel you will require?
- Where can you buy fuel on your journey?
- Do your relatives know of your travel plans?

### The boat's equipment

- Rescue equipment such as life jackets and distress rockets - does everyone on board know where they are?
- Spare parts on board, e.g. water pump wheel (impeller) for the seawater pump.
- Tools which suit the equipment
- Full fire extinguishers.

### The environment

The marine environment is in many ways through natural deterioration and emissions caused by/from human inventions. Our product development gives priority to measures that will make your engine as environmentally-friendly as possible. The injection equipment is therefore set and sealed at the factory to have as little effect on the environment as possible.

As a boat owner, you can help the environment by using the recommended fuel as instructed in the manual. It is important that annual servicing be carried out.

Parts need to be replaced in many of the operations described. Discarded oil and fuel filters always contain a small amount of oil or fuel and must be deposited in special containers. Used and discarded batteries should be deposited at special collection points.

**AB VOLVO PENTA**  
Technical information

# Marine engines

AD31	•	TMD31	•	TAMD31
AD41	•	TMD41	•	TAMD41
KAMD42	•	KAD42	•	KAD42/DPX

## Contents

<b>Introduction</b>		<b>Laying up</b>	
Instruments .....	5	Laying up .....	14
SP-DP control units .....	6	Bring out of storage, launching .....	15
DPX control units .....	7		
<b>Operation</b>		<b>Troubleshooting schedule</b> .....	15
Starting .....	8		
After use .....	9	<b>Technical data</b>	
Measures when freezing is imminent .....	9	Engine and transmission .....	16
<b>Maintenance</b>		<b>Fitting propellers</b> .....	18
Daily inspection before starting .....	10	<b>Maintenance, commercial operation</b> .....	19
Check every 14 days .....	10		
Check every 50 hours .....	11		
Check every 100 hours .....	11		
Check every 200 hours .....	12		
Venting the fuel system .....	13		
Other checks .....	13		

## Important information

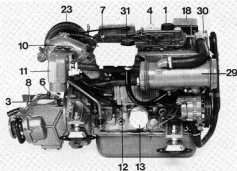


Starting spray must not be used if the engine is equipped with pre-heating.

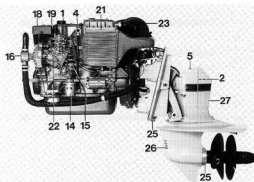
Stop the engine before opening the door of the engine compartment. There are rotating parts on an engine which are dangerous to approach when the engine is running. Bear in mind the risk of fire. All engine fuel is inflammable.

The engine is fluid-cooled. Drain the seawater system when the engine has been stopped if there is a risk of freezing. The freshwater system must be filled with an antifreeze mixture that provides corrosion protection.

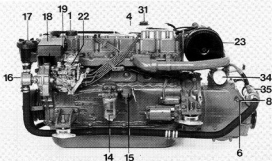
Note that a syphoning action can occur in connection with certain work on the seawater system. Close all cocks and block all hoses if the boat is not checked regularly. Incorrect drainage can cause the boat to fill with water and sink.



TMD 31D/MS4



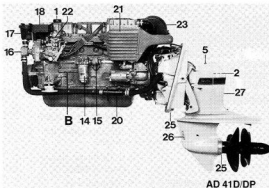
AD 31D/DP



TMD 41D/HS1A

#### List of Items

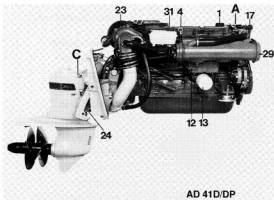
- 1 Oil filler, engine
- 2 Oil filler, drive
- 3 Oil filler, reverse gear
- 4 Dipstick, engine
- 5 Dipstick, drive
- 6 Dipstick, reverse gear
- 7 Oil drain connection, engine
- 8 Oil drain connection, reverse gear
- 9 Oil drain, drive
- 10 Turbo
- 11 Water cooled exhaust elbow
- 12 Oil cooler, engine
- 13 Oil filter engine
- 14 Fuel filter
- 15 Fuel pump
- 16 Seawater pump
- 17 Seawater filter
- 18 Electrical terminal box
- 19 Main fuse, reset
- 20 Oil cooler, Power Steering
- 21 Aftercooler
- 22 Injection pump
- 23 Air filter
- 24 Trim cylinders
- 25 Corrosion protection
- 26 Cooling water inlet
- 27 Cover over gear mechanism
- 28 Compressor
- 29 Heat exchanger
- 30 Thermostat housing
- 31 Cooling water filter
- 32 Steering cylinders
- 33 Drain, Oil cooler/block, KAD42
- 34 Oil filter, reverse gear
- 35 Oil cooler, reverse gear



AD 41D/DP

**List of items**

- 1 Oil filler, engine
- 2 Oil filler, drive
- 3 Oil filler, reverse gear
- 4 Dipstick, engine
- 5 Dipstick, drive
- 6 Dipstick, reverse gear
- 7 Oil drain connection, engine
- 8 Oil drain connection, reverse gear
- 9 Oil drain, drive
- 10 Turbo
- 11 Water cooled exhaust elbow
- 12 Oil cooler, engine
- 13 Oil filter engine
- 14 Fuel filter
- 15 Fuel pump
- 16 Seawater pump
- 17 Seawater filter
- 18 Electrical terminal box
- 19 Main fuse, reset
- 20 Oil cooler, Power Steering
- 21 Aftercooler
- 22 Injection pump
- 23 Air filter
- 24 Trim cylinders
- 25 Corrosion protection
- 26 Cooling water inlet
- 27 Cover over gear mechanism
- 28 Compressor
- 29 Heat exchanger
- 30 Thermostat housing
- 31 Cooling water filter
- 32 Steering cylinders
- 33 Drain, Oil cooler/block, KAD42
- 34 Oil filter, reverse gear
- 35 Oil cooler, reverse gear



AD 41D/DP

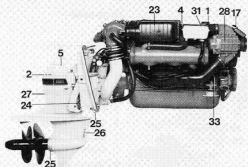
**Type designations (example)**

**Engine:**

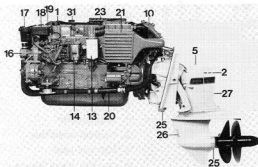


**Reversegear/Drive**

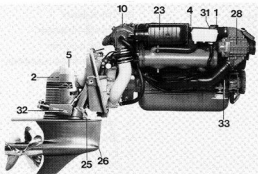




KAD 42B/DP



KAD 42B/DP



KAD 42B/DPX

**List of items**

- 1 Oil filler, engine
- 2 Oil filler, drive
- 3 Oil filler, reverse gear
- 4 Dipstick, engine
- 5 Dipstick, drive
- 6 Dipstick, reverse gear
- 7 Oil drain connection, engine
- 8 Oil drain connection, reverse gear
- 9 Oil drain, drive
- 10 Turbo
- 11 Water cooled exhaust elbow
- 12 Oil cooler, engine
- 13 Oil filter engine
- 14 Fuel filter
- 15 Fuel pump
- 16 Seawater pump
- 17 Seawater filter
- 18 Electrical terminal box
- 19 Main fuse, reset
- 20 Oil cooler, Power Steering
- 21 Aftercooler
- 22 Injection pump
- 23 Air filter
- 24 Trim cylinders
- 25 Corrosion protection
- 26 Cooling water inlet
- 27 Cover over gear mechanism
- 28 Compressor
- 29 Heat exchanger
- 30 Thermostat housing
- 31 Cooling water filter
- 32 Steering cylinders
- 33 Drain, Oil cooler/block, KAD42
- 34 Oil filter, reverse gear
- 35 Oil cooler, reverse gear

## Instruments, Main panel



### Rev counter

This shows the engine speed in revs per minute x 100.

### Speed

It is important that the engine reaches a maximum speed of 3900, or as near this speed as possible, with a normal load. A recommended maximum cruising speed is around 200 r/min below the maximum speed achieved.

NB! Growth on the hull reduces the speed.



### Temperature gauge

During normal use, the temperature gauge should display 75–90°C (165–195°F). The alarm will sound if the cooling water temperature is too high.



If the alarm comes on, reduce the speed to idling in neutral. Find out what is blocking the water supply to the engine if the temperature does not drop. Stop the engine if necessary and rectify the fault.



### Oil pressure gauge

The oil pressure gauge should normally show 300–500 kPa (45–75 psi) when the engine is running. It is normal for the gauge to show a lower reading at lower speeds. An acoustic alarm will sound if the oil pressure is too low.



If the alarm comes on, stop the engine immediately and determine the cause.



### Voltmeter

The voltmeter shows the system voltage. When the engine is running, this is ca 14 V in a 12 V system and ca 28 V in a 24 V system. The voltages are 12 and 24 V respectively when the engine is switched off.



1 2 3 4

### Warning display

The display has three warning windows which, in combination with the acoustic alarm, display red to indicate why the alarm is being sounded:

1. High cooling water temperature
2. Low oil pressure
3. No charge
4. Pre-heating (extra equipment)

## Control units, in combination with SP and DP drives

### Ignition switch



### Single lever control



**S** = Stop position for stopping the engine.

**0** = Everything connected across the key is switched off. The key can be withdrawn from the lock.

**1** = Drive position. The warning display is lit up during the start procedure and the alarm can be tested using "alarm test".

**2** = Used only on engines equipped with pre-heating.

**3** = Start position. Release the key as soon as the engine starts.

**Release.** Lever in neutral **N**. Press the button in the centre of the lever hub. Push the lever forward slightly. Release the button. Only the speed will be affected now. When the lever is returned to the neutral position, it comes out of neutral automatically and the speed, forward and reverse can be regulated.

**F** = FORWARD. Simultaneous control of speed and movement.

**R** = REVERSE. Simultaneous control of speed and movement.

**Trimming and tilting** the drive is done either from the separate control panel or using trim buttons on the control, if the control is suitably equipped.

The drive's trim position is shown on the separate instrument which is available in two configurations - digital and analog.

**1** = TRIM. Max trim: DP = through 5, SP = through 12. Drive position at all speeds.

**2** = BEACH. Used when tying up in shallow water or where there is doubt about the depth. The speed must always be slow.  
DP = 6 through 40, SP = 13 through 40.

**3** = LIFT. Flashing red warning light (digital instruments). Drive fully tilted. The engine must not be run in this position.

### LEDs (digital trim instruments)

**1** Flashes red in tilt range above 40. Otherwise off.

**2** Continuous red light: DP = 6 through 40, SP = 13 through 40. Otherwise switched off.

**3** Continuous green light: DP = 2 through 5, SP = 2 through 12. Otherwise switched off.

**4** Continuous green light in the range 0 through 2. Otherwise switched off.

**5** Continuous green light in trimmed position through 0. Otherwise switched off.

**6** Continuous yellow light in max. trimmed position through 0. Flashes when drive moves and the bow is lowered. Otherwise switched off.

**7** Continuous yellow light: DP = 2 through 5, SP = 2 through 12. Flashes when the drive moves and the bow is raised.

The control panel has three buttons. The bottom one lowers the bow, the middle one raises the bow and the other, red, button in combination with the middle button trims the drive in the Beach range.

The control button on the control lever raises and lowers the bow by pressing its upper or lower segment. The separate switch on the instrument panel must be pressed to put the drive into Beach range.



## Control units, in combination with DPX drive

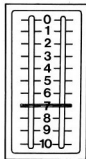
### Ignition switch



### Control



### Trim operations



**S** = Stop position for stopping the engine.

**0** = Everything connected across the key is switched off. The key can be withdrawn from the lock.

**1** = Drive position. The warning display is lit up during the start procedure and the alarm can be tested using "alarm test".

**2** = Used only on engines equipped with pre-heating.

**3** = Start position. Release the key as soon as the engine starts.

Volvo Penta's single lever control has a linked speed and control function and is used as follows:

**Release.** Lever in neutral **N**. Press the button in the centre of the lever hub. Push the lever forward slightly. Release the button. Only the speed will be affected now. When the lever is returned to the neutral position, it comes out of neutral automatically and the speed, forward and reverse can be regulated.

**F = FORWARD.** Simultaneous control of speed and movement.

**R = REVERSE.** Simultaneous control of speed and movement.

The trim indicator, which is mechanically controlled, displays the drive position in the trim range as a digit from 0 to 7. Check during the first test run which trim position provides the best comfort and then use this number as a reference in the future.

When the drive is in the Beach range, 7-10, the speed of the boat must be lower than planing speed. The engine must be stopped when the drive is fully tilted.

The trim indicator displays the position in the Trim range and the beginning of the Beach range only. In the case of a twin installation, individual trimming of the drives is permitted in the trim range. Take note of the trim indicators.



**Warning!** If one drive in a twin installation needs to be tilted in the Beach range, both drives must be tilted at the same time (i.e. parallel) to prevent unnecessary stress on the tie rod between the drives.

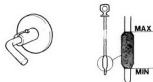
When tilting in parallel, both drives must be trimmed to their forward positions (0) first. Start lifting from this position.

When lowering the drives, it is important for both to be lowered in parallel to avoid stressing the tie rod.

## Driving

### Starting

- 1 Check the oil level in the engine.



- 2 Switch on the main switch.
- 3 Start the engine room fan. Let it run for a few minutes.



- 4 Lower the drive if it is tilted.  
DPX Double installation: Lower both drives at the same time.



- 5 Release the control lever. Idling position.
- 6 Start the engine. (See "Ignition switch".) Adjust the speed to idling.

If the engine is equipped with pre-heating, this must be engaged about 30 s before starting.



**Turbo warning! Do not race the engine immediately after starting. This could damage the turbo compressor.**

- 7 Read the instruments. If the readings are abnormal, stop the engine and determine the cause.
- 8 Check for obstructions in front of and behind the boat before selecting "Forward" or "Reverse".

The maximum cruising speed is maximum speed less ca 200 r/min. Good operating economy is achieved if full throttle is avoided.

We recommend that you decrease speed and raise the drive(s) to Beach range when operating in shallow water.



**DPX twin installation:** The drives must be tilted simultaneously to avoid stress on the tie rod.

Check the instruments regularly while driving. Stop the engine to determine the cause if any reading is abnormal.

### KAD42, KAMD42

The engine is equipped with a mechanical compressor which provides powerful acceleration up to the planing position. The compressor is engaged and disengaged electronically depending on the speed. Engagement is at ca 1700 r/min depending on the setting and disengagement takes place at ca 3100 r/min.

The compressor also has a "kickdown" function which engages the compressor at speeds from idling to 3100 r/min.

When operating in the vicinity of the compressor's engagement/disengagement speeds, the compressor can be engaged/disengaged for brief periods. If this is done, adapt the speed so that the compressor is either constantly engaged or disengaged. The engine sound changes when the compressor is engaged. This is quite normal.

## Power Trim

- 9 The built-in trim function can be used to achieve planing and a more comfortable ride much more quickly. The drive should be in the trim range during normal planing.

Raise or lower the bow using the buttons on the panel or the buttons on the control lever. The instrument indicates the drive's position.

Refer also to "Control units".

- 10 Reversing can be done with the drive in "Trim" or "Beach". Always allow the speed to decrease to idling before selecting "Reverse".



**WARNING:** Never select reverse when the boat is planing.

## After use

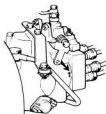
- 11 After use and when the boat is tied up, it is important for the engine to run at idling for at least 1 minute to avoid subsequent boiling of the coolant.

- 12 Trim the drive to the maximum trimmed position to protect the trim cylinders' untreated surfaces from fouling. The exception to this is when there is a risk that the drive could run aground. The drive then must be raised instead to the maximum position. Do not forget to lower the drive before starting.

**DPX double installation:** Both drives must be tilted at the same time and lowered at the same time before starting.

Stop the engine using the ignition switch.

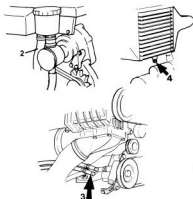
**CAUTION.** Never switch off at the main switch before stopping the engine. This could damage the alternator.



- 13 The engine can be stopped in an emergency by pulling the injection pump lever backwards.

- 14 Switch off the main switch.

- 15 Check for leaks around the engine and that everything else in the engine compartment appears normal.



- 16 In cold weather when there is a risk of freezing, it is important that the freshwater system's coolant has sufficient frost protection. The seawater system must be drained.

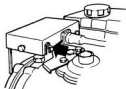
Watch out for leakage into the boat. Drain as follows:

Undo the hose (2) from the seawater filter and bend it down so that the water runs out. Reconnect the hose. Drain the oil cooler and the after-cooler (4), and undo the cover on the seawater pump and allow the water to drain out. Drain the oilcooler on the KAD42 via the hose (3) marked blue.

Reverse gear HS1A and MS4: Close the bottom cock and undo the hose on the oil cooler port side.




**Do not forget to close the cocks. Never leave the boat with open cocks or hoses that are not connected. There is a risk that the boat could sink.**



- 17 An automatic fuse may have tripped if the engine cannot be started or if the instruments display 0 readings. If this is the case, reset the fuse using the button. Always investigate the cause of overloading.

## Regular maintenance

### Daily inspection before starting

-  To avoid injury, always make sure that the engine is switched off before starting work on it. There are many moving parts - pulleys, drive belts etc.




**Check the oil level in the engine.** When checking the level refer to "Technical data" for the correct type of oil.


**CAUTION** Fill to no higher than the "Max" mark. Never allow the level to go below the "Min" mark.



### Checking the coolant level

-  **Warning!** Observe extreme caution when checking the coolant level if the engine is hot or running - the system is pressurized.

Turn the cap on the expansion tank to the first stop to relieve the pressure. The level should be between the maximum and minimum marks when the engine is hot. It is normal for the level to be lower when the engine is cold. Fill as required when the engine is running.

-  **CAUTION!** Beware of moving pulleys and drive belts.

Use Volvo Penta type 90 coolant or a 50/50 mixture of antifreeze and water.

---

### Check every 14 days

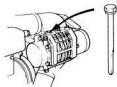
---

**Check the oil in the reverse gear** with the engine stopped. Do not screw in the dipstick. Replenish as required according to "Technical data".

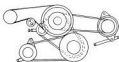


**Drain the water from the fuel filter.** Open the vent screw (1) 3 turns, then the drain screw (2) and let any water run out. Vent the fuel system.

**Check the oil level in the compressor (KAD42)** with the engine stopped. Screw in the dipstick. Change the oil every 200 hours.



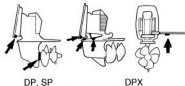
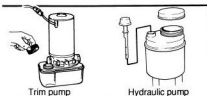
31, 41



42

**Check the belt tension.** Excessive tension will damage the bearings in the water pump and alternator. Insufficient tension will cause slipping. Replace worn belts.


Check the corrosion protection for pitting.  
When replacing – scrape the mating surface clean.

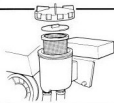


Check the oil level in the trim pump and the hydraulic pump with the drive trimmed. Refer to "Technical data" for the type of oil. Never mix engine oil and ATF oil.

### Check every 50 hours

Check the seawater filter more regularly if there is a risk of blockages.


 **Warning!** Beware of water penetration.

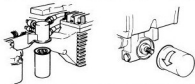


Lubricate the steering shaft bearing with water-resistant grease.

### Check every 100 hours or at least once every season


Change the engine oil. To be done after 20 hours on new or reconditioned engines. See "Technical data" for the type of oil.

 **Warning!** Hot oil can cause burns.



Change the oil filter after the first 20 hours and then every 100 hours.

Screw on the filter until it stops and then a further 1/2 turn, no more. Check for leaks.

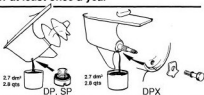
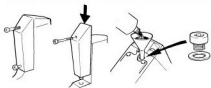
 Check the electrolyte level in the battery. **WARNING!** Risk of explosions. No naked flames. Electrolyte is corrosive. Rinse with water if it gets in the eyes. Call a doctor immediately!



Maintain quality and safety.  
Always use VOLVO PENTA original parts - it pays in the long run.

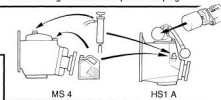
## Check every 200 hours or at least once a year

**Drain the oil** from the drive. Contact your VP Service workshop if the oil is discolored (gray). Remember the environment and drain the oil into a suitable container.

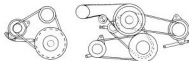


**Fill with new oil.** Refer to "Technical data" for the type of oil. Do not screw in the dipstick when checking. Drain or add oil for the correct level. Check the tightness of the dipstick and plug.

**Change oil in reverse gear.** Refer to "Technical data". Change oil filter. Check level. Run engine at idling for a few minutes. Add oil as required.



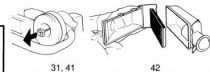
**Change drive belts** if worn or split. Check tension after a few hours of use.



31, 41

42

**Replace the air filter.** The engine must not be running - risk of injury! Prevent ingress of dirt.



31, 41

42

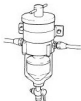
**Check the pump impeller.** Ensure there is no water penetration!

Replace pump impeller if defective. If the shaft can be rotated, replace the carrier.

**Replace fuel filter.** Avoid spilling fuel. Consider the environment when discarding the old filter. Tighten the new filter until it stops then turn further 1/2 turn. Bleed system and check for leaks.



**If an extra fuel filter is fitted,** change the filter cartridge and drain the water. Water can damage the injection pump and injectors.



## Venting the fuel system

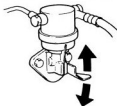
Venting must be carried out in the following cases before the engine can be started:

- When a filter is replaced
- When the engine runs out of fuel
- When the injection pump has been removed
- When the fuel system is repaired
- Leakages or if the fuel lines are opened
- If the engine has not been run for a long time

Venting is done as follows:

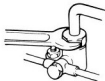


Open 4 turns. Avoid spilling fuel. Pump manually.



Close when air-free fuel appears. If the pump effect is poor rotate the engine a little.

If the engine does not start, continue bleeding. Pump manually for ca ½ minute for automatic bleeding of the injection pump.



Undo all pressure pipe nuts. Set the speed control to full speed. Run using the starter motor until fuel appears. Avoid spillage. Tighten the nuts.

## Other check

Some checks and tasks require special knowledge and we therefore recommend that you use an authorised workshop. The following checks fall into this category:

- Checking the turbo compressor (200 hours)
- Adjusting the valves (200 hours)
- Checking the starter motor and alternator (200 hours)
- Checking the injectors (600 hours)
- Checking the electrical system (200 hours)
- DPX:** Checking the hydraulic hoses and connections, inside and outside the transom shield
- DPX:** Checking the tie rod plastic bushings for excessive wear.

The cooling system operates normally when the gauge shows 75–90°C (165–195°F). Overheating can be caused by the following:

- Blocked seawater inlet, seawater filter or oil cooler.
- Defective pump impeller and/or carrier in seawater pump.
- Air in freshwater system.
- Coolant level low.
- Slipping or broken drive belt for circulation pump.
- Faulty thermostat, temperature gauge or instruments.

**Avoid water penetration** when working on the cooling system.



**If the boat must be left with parts of the cooling system removed, make sure that water cannot leak into the boat in an uncontrolled manner causing it to sink.**

**Never top up** the cooling system with water alone since the coolant properties with respect to boiling point, corrosion protection and frost protection may be reduced.

Drain and flush the cooling systems once a year.

If the boat is used in water with a high salt content or in abnormally contaminated water, it is important for the seawater system to be flushed more often with freshwater. This avoids the accumulation of deposits and salt crystals.

## Laying-up

If the boat is unlikely to be used for more than 90 days, or if there is a risk of frost, it must be put into storage.

**Long-term laying-up** during the winter.

Let an authorized workshop test the engine and equipment before the boat is taken out of the water.

Do the following while the boat is in the water:

- Drain the engine oil once the engine is hot.
- Change the oil filter.
- Fill with engine oil to the correct level. See Technical Data.

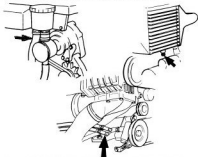
Do the following with the boat laid up:

- Change the fuel filter.
- Bleed the fuel system.
- Change the air filter.

### Seawater system

Flush the seawater system by placing one end of a suction hose from the pump into a bucket of fresh water. Arrange so that it can be refilled, then start the engine and let it idle for a while. It is very important to flush out any deposits and to avoid any salt crystals being formed. **CAUTION! Do not allow the pump to run dry.**

To avoid corrosion damage in the cooling water channels, these must be filled with a mixture of 50/50 fresh water and anti-corrosion glycol, or a mixture of fresh water and emulsifying oil. The latter mixture **does not provide any frost protection** and must therefore be drained directly.



The procedure is as follows for both mixtures:

Place the end of the suction hose in a bucket containing the mixture. Provide a collection vessel to return mixture to the bucket. Make sure nothing is splashed. Run the engine for a few minutes. **CAUTION! Do not let the pump run dry.**

The antifreeze mixture need not be drained until shortly before setting the boat back in the water.

**CAUTION! Do not throw the mixture into the water.**

Remove the pump impeller when laying-up for the winter and store it in a cool place.

### Freshwater system

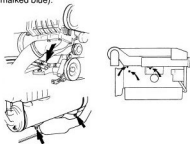
Inhibiting can be done in two ways:

Option 1. Check the freezing point if the system is filled with an antifreeze mixture.

Option 2. If the system is filled with a corrosion-protection mixture, it must be replaced once every season.

**CAUTION! The latter mixture (option 2) does not provide frost protection.**

Drain points: exhaust manifold, heat exchanger and engine block (KAD42: through the hose not marked blue).



The system can be left empty during the winter but do not forget to refill it before putting the boat back into the water.

### Other tasks

**Change the oil** in the drive or the reverse gear.

**Remove the propellers** for winter storage and lubricate the propeller shafts with rust protection oil.

**Provide corrosion protection** for control components and cables and the components of the electrical system.

**The finish** on the engine and drive must be checked. Touch up the paint where necessary to prevent corrosion damage.

**The battery** can be kept on board only if it is fully charged.

**Fill the fuel tanks** to avoid condensation. Check that you are allowed to store the boat with its tanks full.

**The vacuum valve**, if fitted, shall be dismantled for cleaning.



## Bringing out of storage and launching

**Check the oil levels** in the engine and drive. If special inhibiting oil is used, replace with oil according to the Technical Data. **Check the coolant level** and the frost protection. Use Volvo Penta coolant type 90.

**Check the tightness of the hose clamps** at the same time as the condition of the bellows is checked.



**WARNING:** Never work on the drive hose clamps, bellows or hydraulics without securing the drive so that it cannot fall down. Special tool (885143-8) is used to lock the drive in the tilted position. A falling drive can cause severe injury.

The joint bellows and hose clamps should be replaced every other year.

**Check the tightness of the steering helmet screws (SP, DP)** which link the steering helmet to the drive. See Technical Data.

### Painting the drive and the bottom of the hull

Check the paint on the outboard drive. Touch up damaged areas using Volvo Penta original paint. Then paint the drive with a teflon-based agent for aluminum drives. We recommend Volvo Penta anti-fouling agent. These teflon-based agents are specially designed for the drive and are as kind as possible to the environment. **CAUTION! Never paint the drive's zinc anodes or treat them with teflon.**

Paint the hull of the boat with a suitable bottom paint or a pure teflon agent. All anti-fouling paints are toxic and are more or less harmful to the environment. Avoid using such agents. Most countries have legislation which regulates the use of anti-fouling bottom paint. Always comply with such legislation. If it is necessary to use anti-fouling paint, use a pure copper-based paint which contains copper thiocyanate. The paint must not contain copper oxide.

Tin-based paints (TBT) must not be used.

Find out about the legislation which applies for the area where the boat is going to be used. Do not paint closer than 10 mm (.4") to the shield/drive.

**Check that the batteries** are fully charged.

**Bleed the fuel system.**

**A propeller shaft seal (inboard)** made of rubber shall be vented after launching by pressing together the opening and pushing it down until water appears. Force about 1 cm<sup>3</sup> of water-resistant grease into the seal.

**Replace the propeller shaft seal every 5 years.**

**Fit the propellers.** See page 18 for an illustrated description.

**Launch the boat.** Check the functions and for leaks.

## Troubleshooting schedule - engine

Does not start	Stops	Does not reach full speed	Runs unevenly, vibrates	Abnormally hot	Cause
<input type="checkbox"/>					Check the battery, electric cables, main switch, automatic fuse
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			Check the amount of fuel, fuel cock, fuel filter
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Water, air, contamination in fuel/filter
		<input type="checkbox"/>	<input type="checkbox"/>		Defective injectors
		<input type="checkbox"/>			Boat abnormally loaded, fouling on the hull of the boat.
		<input type="checkbox"/>	<input type="checkbox"/>		Blocked air filter, faulty turbo compressor, damage to propeller.
				<input type="checkbox"/>	Blocked coolant intake, blocked water filter, incorrect freshwater level, defective pump impeller or thermostat, air in cooling system.

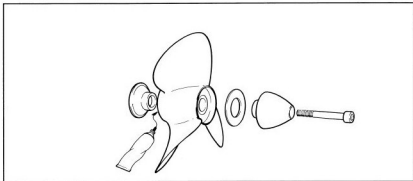
## Technical Data

Engine designation .....	<b>AD31D</b> <b>TMD31D</b> <b>TAMD31D</b>	<b>AD41D</b> <b>TMD41D</b> <b>TAMD41D</b>	<b>KAD42B</b> <b>KAMD42B</b>
Idling speed, r/min .....	650-750	600-700	600-700
Swept volume, dm <sup>3</sup> .....	2.39	3.59	3.59
Injection sequence .....	1-3-4-2	1-5-3-6-2-4	1-5-3-6-2-4
Direction of rotation, seen from front .....	Clockwise	Clockwise	Clockwise
Max. forward tilt .....	4°	4	4°
Max. backward tilt during operation .....	15°	15°	15°
Max. side tilt during operation .....	20°	20°	20°
Valve clearance, inlet/outlet, cold, mm(in) ...	0.40 (0.016)	0.40 (0.016)	0.40 (0.016)
Engine, oil capacity, dm <sup>3</sup> , excl. oil filter .....	8.5 (9qts)	10.5 (11qts)	10.5 (11qts)
Engine, oil capacity, dm <sup>3</sup> , incl. oil filter .....	9.0 (9.5qts)	11.0 (11.5qts)	11.0 (11.5qts)
At 15° backward tilt, excl. oil filter .....	9.0 (9.5qts)	11.0 (11.5qts)	11.0 (11.5qts)
At 15° backward tilt, incl. oil filter .....	9.5 (1 0qts)	11.5 (12qts)	11.5 (12qts)
Oil quality .....	VDS or CD	VDS or CD	VDS or CD
Viscosity .....	SAE 15W/40	SAE 15W/40	SAE 15W/40
Oil pressure, hot engine			
Idling, kg/cm <sup>2</sup> (lbs/in <sup>2</sup> ) .....	1.5 (21)	1.5 (21)	1.5 (21)
Full speed, kg/cm <sup>2</sup> (lbs/in <sup>2</sup> ) .....	4.2-5.0 (59-71)	4.2-5.0 (59-71)	4.2-5.0 (59-71)
<b>Drive, SP</b>			
Oil capacity, dm <sup>3</sup> .....	2.6 (2.7qts)	2.6 (2.7qts)	
Oil quality, viscosity .....	See engine	See engine	
Oil capacity between max and min, dm <sup>3</sup> .....	0.15 (0.2qts)	0.15 (0.2qts)	
<b>Drive, DP</b>			
Oil capacity, dm <sup>3</sup> .....	2.7 (2.8qts)	2.7 (2.8qts)	2.7 (2.8qts)
Oil quality, viscosity .....	Volvo Penta, part no. 1141572-6 (APIGL5SAE75W/90 Synthetic)		
Oil capacity between max and min, dm <sup>3</sup> .....	0.15 (0.2qts)	0.15 (0.20qts)	0.15(0.20qts)
<b>Drive, DPX</b>			
Oil capacity, dm <sup>3</sup> .....			2.0 (2.06qts)
Oil quality, viscosity .....	Volvo Penta, part no. 1141572-6 (APIGL5SAE75W/90 Synthetic)		
Oil capacity between max and min, dm <sup>3</sup> .....			0.15 (0.20qts)
<b>Reverse gear, MS4</b>			
Oil capacity, dm <sup>3</sup> .....	1.7 (1.8qts)	1.7 (1.8qts)	1.78 (1.8qts)
Oil quality, viscosity, .....	Volvo Penta, part no. 1141572-6 (APIGL5SAE75W/90 Synthetic)		
<b>Reverse gear, HS1A</b>			
Oil capacity, dm <sup>3</sup> .....		3,3 (3.5qts)	3,3 (3.5qts)
Oil quality, viscosity,.....		See engine	See engine
<b>Compressor</b>			
Oil capacity, dm <sup>3</sup> .....			0,1 (0.1qts)
Oil quality .....			Volvo Penta, Part No.1141592-4

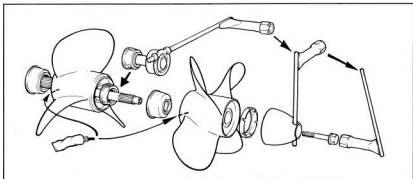
## Technical Data

Engine designation .....	AD31D TMD31D TAMD31D	AD41D TMD41D TAMD41D	KAD42B KAMD42B
<b>Power Trim</b>			
Oil capacity, dm <sup>3</sup> .....	1.0 (1.1qts)	1.0 (1.1qts)	1.0 (1.1qts)
Oil quality, viscosity .....	See engine	See engine	See engine
Oil quality, DPX .....			ATF, Type G
<b>Power Steering</b>			
Oil quality, viscosity .....	See engine	See engine	See engine
<b>Hydraulic steering, Volvo Penta</b>			
Oil quality .....	Volvo Penta part no.1140595-8, Shell Aero 4, Texaco HO15 Esso Univil N15, Chevron Aviation Fluid A, Mobil Aero HFA		
<b>Hydraulic steering, DPX</b>			
Oil quality .....			ATF, type G
<b>Cooling system</b>			
Thermostats open/fully open .....	81°C/94°C 178°F/201°F	81°C/94°C 178°F/201°F	81°C/94°C 178°F/201°F
Freshwater system capacity, dm <sup>3</sup> .....	13 (13.5qts)	19 (20qts)	20 (21qts)
<b>Electrical system</b>			
System voltage .....	12	12	12
Starter motor battery, capacity, Ah .....	140	140	140
Battery electrolyte spec. gravity:			
Charge at g/cm <sup>3</sup> .....	1.230	1.230	1.230
Fully charged at g/cm <sup>3</sup> .....	1.275–1.285	1.275–1.285	1.275–1.285
Alternator max output .....	14V 60A	14V 60A	14V 60A
Starter motor, output hp (kW) .....	3.4 (2.3)	3.4 (2.3)	3.4 (2.3)
<b>Tightening torque</b>			
Steering cover screws SP, DP, kpm (Nm) ...	3.5 (35)	3.5 (35)	3.5 (35)

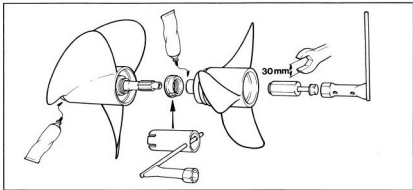
### Fitting propeller, SP



### Fitting propellers, DP



### Fitting propellers, DPX



## Maintenance instructions, installations in commercial use, with SP and DP drives

The more detailed instructions given in the instruction book must be followed in addition to these brief instructions. This applies to items of equipment as well as when running-in the engine.

Note that the service intervals for installations in commercial operation differ from the intervals given in the instruction book.

The checks which should be carried out by technicians at an authorized workshop are written in *italics*.

### Daily

Visual inspection of the drive and propellers. Damaged propellers must be replaced.

### Monthly

Check the corrosion protection on the drive and shield. Replace when half the anode has been corroded. Check the universal joint and exhaust bellows.

Replace as required.

Check painted surfaces for corrosion damage and/or places where mechanical action has removed the paint. If necessary touch up the paint.

### Annually

Clean and touch up paint.

*Replace the universal joint and exhaust bellows.*

Replace the exhaust bellows between the engine's exhaust bend and the shield's exhaust pipe.

### After the first 2-5 hours

Run in the engine with a light load. The oil in the engine and drive must be changed at the end of the running-in period. Make sure that the drive is properly drained.

### Every 125 hours

Change the lubricating oil. See the recommendations in Technical Data.

Lubricate the guide bushings in the shield.

Check the oil level in the servopump (on the engine).

Check the oil level in the trim pump.

Check the tightening torque at the following points:

- 1 The joint between the lower gear housing and the intermediate housing.*
- 2 The joint between the upper gear housing and the intermediate housing.*
- 3 The screw for the steering arm and the steering spindle.*

Tighten the hose clamps.

Check the universal joint bellows for any water leakage and wear.

### Every 500 hours

*Check the bushings in the suspension fork.*

*Check the steering guide bushings and seal in the shield.*

*Check for play in the holes for the drive mounting journals in the drive.*

Lubricate the steering guide bearing in the suspension fork.

Check the control cable, cable cub and controls.

Check the grounding of the trim cylinders and shield.

Check the servo cylinder and hoses for any oil leakage.

*Check the propeller shaft for straightness.*

*Check the gear mechanism for wear and function.*

Check the "non-return valve" in the exhaust.

*Check that there is no abnormal play in the steering.*

### Every 1000 hours

*Change the drive for a replacement drive or recondition drive.*

Replace control cables and cable cub.

Check the exhaust pipe for corrosion damage.

Check the bellows between the exhaust pipe on the engine and the exhaust pipe on the shield.

Check the cooling water hoses and connection on the inside of the shield.

Check the hydraulic hoses for leakage and wear on the outside of the shield.

Additional action may be necessary if the type of operation differs significantly from Volvo Penta's application classes or if gear-changing is more frequent (more than 20 changes per hour on average).

### Restrictions

This maintenance instruction applies to:

Engine AD41 "Medium Duty" (165 hp / 3800 r/min).

Engine AD41 "Light Duty" (200 hp / 3800 r/min).

Maximum drive extension for commercial operation = 1".

If the water is severely polluted, particular attention must be given to corrosion damage.

Long period of operation in neutral position should be avoided. The gear for forward propulsion must be engaged for a continuous period of at least 5 minutes for every hour of use.



**VOLVO PENTA DIESEL  
AND GASOLINE ENGINES**

**LAYING-UP AND  
LAUNCHING GUIDE**

# TIME WELL INVESTED

This guide covers most of the items to be checked and seen to on your engine and drive when laying up and launching. Although it won't take more than a couple of hours of your time each year, your engine will run more reliably and economically and use less fuel, with less chance of unnecessary breakdowns. Life at sea will be safer.

You will find more detailed information in your engine instruction book and our do-it-yourself manuals. Or consult your authorized Volvo Penta dealer, he will be pleased to carry out your servicing and maintenance, if you do not wish to do it yourself. Certain complicated jobs are, of course, best left to an authorized dealer since they call for both specialized knowledge and special tools.

Always use Genuine Volvo Penta Parts. That way you can be confident that the parts you use will be of the right quality and fit perfectly. And make sure you have tools on board and that your on board repair kit is complete.

Remember the environment – collect any oil, coolant, degreaser, paint, etc., and dispose of them in the proper containers.



The time intervals mentioned by us are only general and can vary between different engine types. The operator's manual will give you the proper intervals for your particular engine. However, entirely different intervals apply, if you use the engine for commercial purposes or in very polluted waters.

Oil and oil filter changes	4
Cooling system	8
Thermostat	10
Impeller	11
Cooling water hoses/Exhaust hoses	12
Drive belts	13
Fuel system	14
Air filter/Air intake silencer	15
Electrical system	16
Oil changes - drive/reverse gear	18
Drive	20
Propeller	22
Cleaning and painting	23
Ventilation	24
Corrosion protection - inside the engine	25
Ignition system	26



This symbol represents work in connection with the laying-up season



This symbol represents work in connection with the launching season

**⚠** A yellow box represents warning text

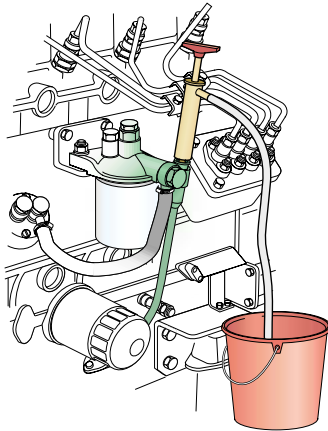


# OIL AND OIL FILTER CHANGES

You should change the engine oil and oil filter after approx. 100 hours of operation, or at least once per season.

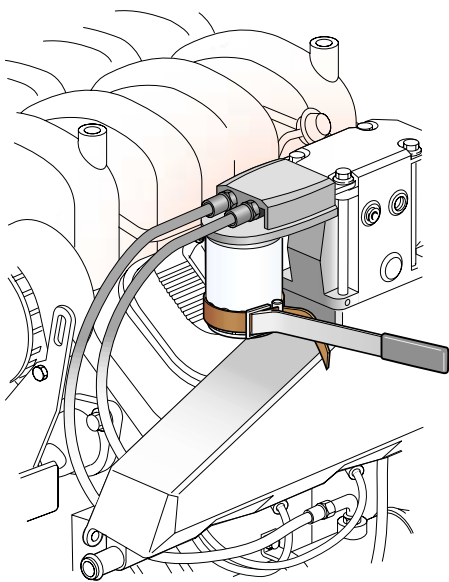
Choose Volvo Penta engine oil which has good inhibiting qualities and you will not need to add any special inhibiting oil for a normal winter lay-up.

A new oil filter will remove soot and metal particles from the oil and prevent unnecessary engine wear. Genuine Volvo Penta filters are tested and specially designed to suit each particular engine type.



Run the engine warm before changing the oil. It is easier to do this when the boat is still in the water (it can also be done in connection with engine inhibiting).

Switch off the engine and use an oil bilge pump to pump out all the engine oil through the dipstick hole. Change the oil filter and fill up with the right amount of Volvo Penta engine oil. Also change transmission oil, please refer to the "Oil changes – drive/reverse gear" chapter. Run the engine for a while. Check for oil leaks.



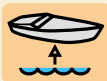
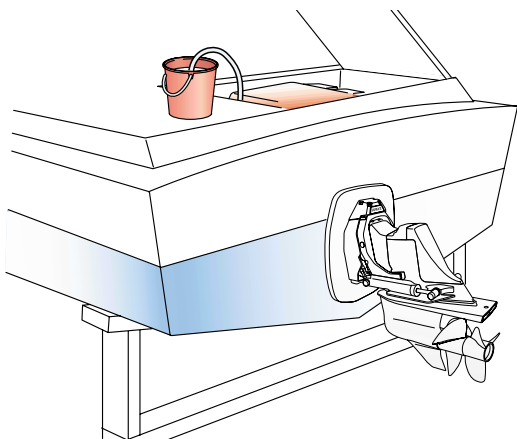
Check the oil level before starting the engine.

# COOLING SYSTEM

## INHIBITING SEA WATER COOLED ENGINES

Regular maintenance and servicing of the cooling system is an effective way of preventing damage from overheating. It is also important to inhibit the cooling system for the lay-up season in order to avoid frost damage and corrosion.

**⚠ Work on the cooling system is best carried out on land. Otherwise there is a risk of water getting into the boat.**



The engine and reverse gear cooling water ducts must be flushed and drained off. Detach the suction pipe from the inside of the shield on the Aquamatic drive or from the reverse gear. Connect a hose to the suction pipe and insert it in a bucket of fresh water. Make sure that the bucket is continually replenished with fresh water. Let the engine idle until it warms up enough to open the thermostat.

**⚠ Never let the water pump run dry.**



It is important to let the engine run for a while, in order to flush away any sludge and salt that could otherwise cause rusting. Then switch off the engine. Insert the free end of the hose into a solution of water and Volvo Penta coolant. Allow the liquid to circulate for a while, without the bucket becoming empty. Switch off the engine and replace the suction pipe.

**N.B.** Leave the liquid in the system, as it provides good protection against freezing and corrosion.

Check and clean sea water filter, if fitted.

If you wish to protect the engine over a longer period than the normal lay-up time, use Volvo Penta emulsifying inhibiting oil, as it is specially designed for the cooling water ducts. Follow the same procedure as above, but empty the system completely, as the liquid does not offer any protection against frost.



Check that all plugs and drain cocks are fully closed.

**N.B.** Some engines have zinc anodes on the plugs and these act as sacrificial anodes in the cooling system. An anode must be replaced when about 50% of its volume has been used up.

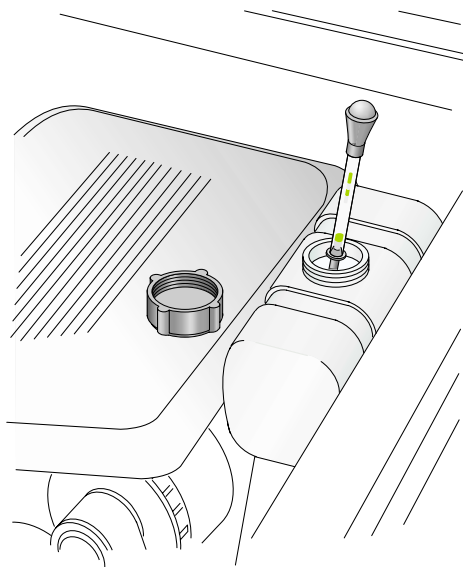
# COOLING SYSTEM

## INHIBITING FRESH WATER COOLED ENGINES

Regular maintenance and servicing of the cooling system is an effective way of preventing damage from overheating. It is also important to inhibit the cooling system for the lay-up season in order to avoid frost damage and corrosion.

**⚠ Work on the cooling system is best carried out on land. Otherwise there is a risk of water getting into the boat.**

The fresh water cooled engine has two cooling systems. The engine block and cylinder head are fresh water cooled. But the oil cooler, heat exchanger and, on some engines, exhaust pipes, are sea water cooled and should be inhibited in accordance with the section on sea water cooled engines.





Check the freezing point of the coolant with a hydrometer and top up the cooling system if necessary. The coolant mixture loses its corrosion protective qualities with time and should therefore be changed every other year.

**N.B.** Avoid mixing different types of coolants since it drastically diminishes the corrosion protective qualities.

Do not mix coolant with other additives.

Check and clean sea water filter, if fitted. Inhibit the sea water cooled part of the engine in accordance with the section on sea water cooled engines (see page 7).

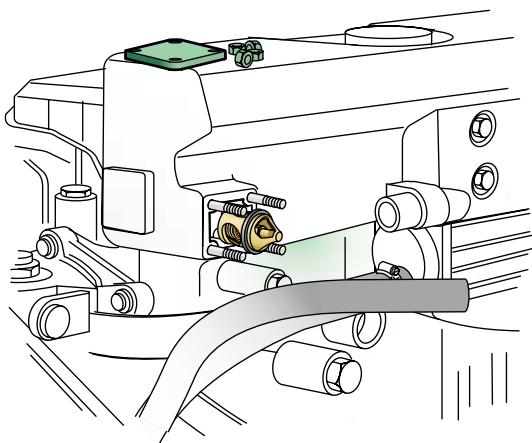


Check the level of the fresh water system and make sure that all plugs and draining cocks are fully closed.

**N.B.** Some engines have zinc anodes on the plugs and these act as sacrificial anodes in the cooling system. An anode must be replaced when about 50% of its volume has been used up.

# THERMOSTAT

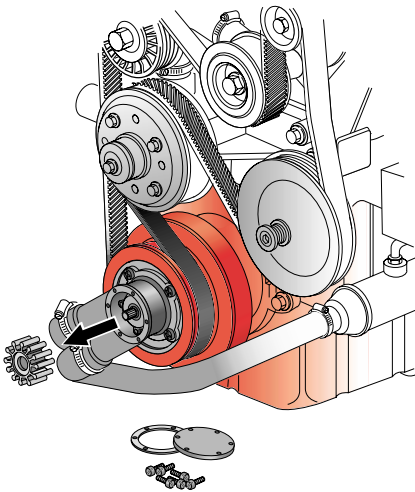
If your instrument panel has a temperature gauge you will be able to see whether the engine stays at the right working temperature or not. Excessive temperatures are often caused by blockage in the coolant intake, cooling ducts or heat exchanger, or by a defective impeller. Too low a temperature is usually caused by a faulty thermostat.



Check the function of the thermostat by removing it and placing it with a thermometer in a pan of water. Heat the water and see if the thermostat opens at the temperature indicated in the operator's manual. If not, replace the thermostat.

# IMPELLER

The impeller pumps cooling water through the engine cooling system. It is, therefore, an extremely vital safety feature. Replace the impeller at least every two years. However, a worn or damaged impeller must be replaced immediately. Make a habit of keeping a spare impeller, and seal for the impeller pump cover, on board.



After inhibiting, unfasten the sea water pump cover and remove the impeller. Rinse it well and keep it in a tightly sealed plastic bag in a cool place during the lay-up period.



Install a perfect impeller and impeller cover together with a new seal.

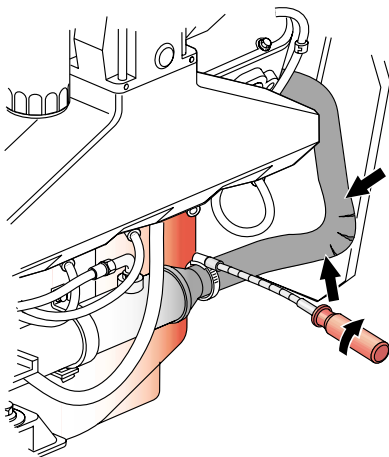


# COOLING WATER HOSES / EXHAUST HOSES

As rubber becomes brittle with time, you should occasionally check the hoses for any signs of cracks or damage

⚠ Leaking cooling water hoses are a safety hazard and can cause the engine to overheat or the boat to become filled with water.

⚠ Leaking exhaust hoses can cause dangerous exhaust fumes on board and allow water to get into the boat.



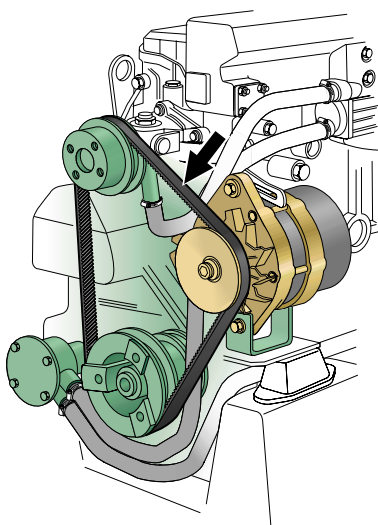
Carefully inspect the hoses and clamps of the cooling system and exhaust system. Replace those hoses which do not feel soft and pliable. Tighten all hose clamps.



Check the condition of the hoses and that all hose clamps are securely fastened.

# DRIVE BELTS

Check on the generator belt and the fresh water pump drive belt a few times a year to make sure that they are properly tensioned. Make sure that they are not cracked or frayed. A perfect drive belt gives a better generator charging effect while, at the same time, reducing the risk of overheating. Always keep spare belts on board. Genuine Volvo Penta drive belts last much longer.



Check the condition of the belts.  
Replace them if necessary.

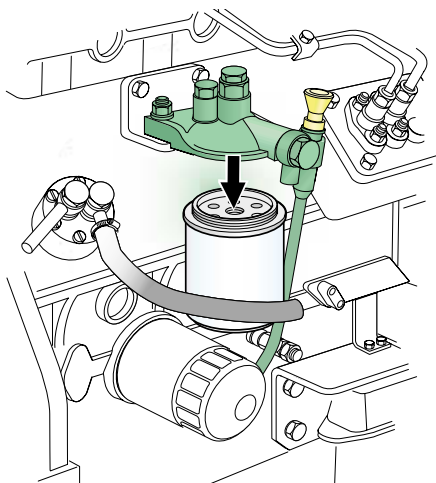


After replacement – tighten the belts  
and adjust the tension.

**N.B.** Check the belt tension once more  
after a few hours running. Readjust, if necessary,  
according to the Operator's Manual.

# FUEL SYSTEM

It is important, when overhauling and servicing the fuel system, to consider the safety aspects and always use Genuine Volvo Penta Parts. It is particularly important to avoid getting any dirt into the system.



Fill the fuel tank for the lay-up period and you won't have to worry about condensation in the tank.

Check before you fill up that there are no special rules applicable to the site where the boat is laid up, about the quantity of fuel aboard.



Venting the fuel system (see operator's manual) and run the engine warm, while checking for leaks.

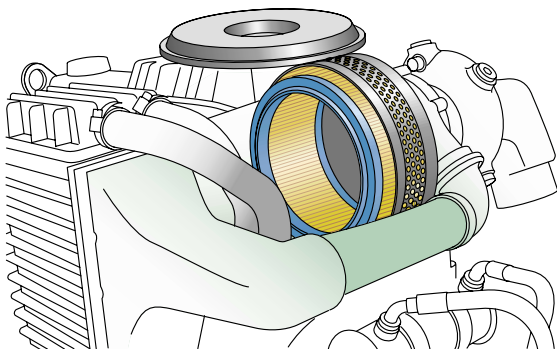
**⚠ Switch off the engine immediately if you discover any leaks.**

# AIR FILTER / AIR INTAKE SILENCER

If your engine has an exchangeable filter element, it should be changed at least once per season.

An engine with a clean air filter can work more efficiently and uses up less fuel.

Use Genuine Volvo Penta filters, they are specially designed and tested for each particular engine type.

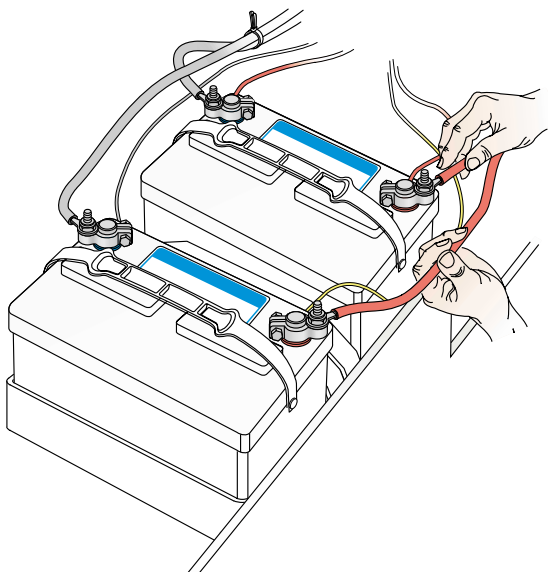


Change the filter element or clean the air intake silencer. Also replace the crankcase ventilation filter (if any).

# ELECTRICAL SYSTEM

Sea air, which can be very humid and salty, presents a tough environment for the electrical system to operate in. The electrical system of the engine can be affected by creeping current, oxidation and voltage drop if you do not overhaul it regularly.

Make sure that the wires are undamaged and have not been subjected to bilge water. Otherwise there is a risk that leakage currents can get to the engine/drive or to the bilge water in the bilge. Serious corrosion damage can occur within a short time if leakage currents knock out the galvanic corrosion protection.

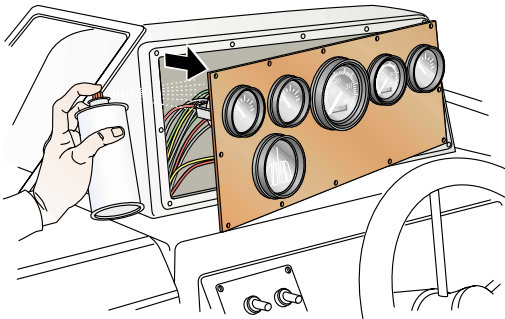


**⚠ Important! A battery will be seriously damaged if discharged for longer periods. A discharged or badly charged battery can be ruined by freezing.**



Remove the battery cables, clean the cable clamps and apply the appropriate type of grease to the battery poles.

Check the electrolyte level and charge the batteries. Batteries discharge when not in use, so you should recharge the batteries once a month, or once every two months, depending on storage temperature. The warmer the storage conditions, the faster the discharging process. The battery can be left on board if it is fully charged.



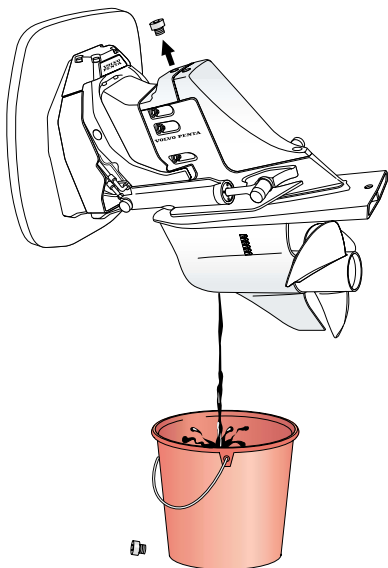
Clean and dry dirty and damp cables. Spray the connection points, contacts and fuse holders on the engine and under the instrument panel with Volvo Penta Universal Oil. Also loosen and clean any oxidized connection points.



Check all fuses and make sure that there are spare fuses on board. Connect the fully charged battery and grease the poles with pole grease.

# OIL CHANGES DRIVE/REVERSE GEAR

⚠ It is absolutely vital that you follow the safety recommendations in the operator's manual very carefully when you work with the drive and shield. Otherwise, you run the risk of seriously hurting yourself.



Change the oil in the drive/reverse gear. Be careful to use the right oil quality. Fill up to the right level and run the engine for a moment to make the oil circulate. If the old oil looks grey, it could be the result of water leaking into the drive. Contact your authorized Volvo Penta workshop if your oil looks grey.

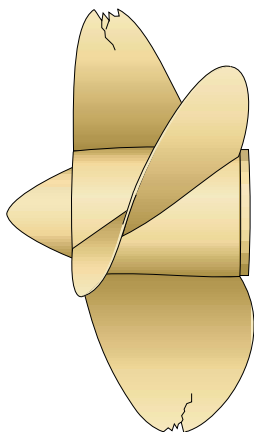


Check the oil level.

# PROPELLER

A propeller must be in good condition to give you maximum output from your engine. A damaged propeller causes vibrations and reduced speed. In bad cases it can even cause bearing damage. Even minor damage to the propeller can easily lead to cavitation (looks like corrosion damage). Repair such damage and paint where necessary. And always keep a spare propeller on board.

The mechanism of the folding propeller must be greased with Volvo Penta water resistant grease. Please see the detailed instructions in the manual when removing and refitting propeller/s.



Remove the propeller/s and grease the propeller shaft/s with Volvo Penta water resistant grease.



Refit the propeller/s. Remember to grease the shaft/s first.



# CLEANING AND PAINTING



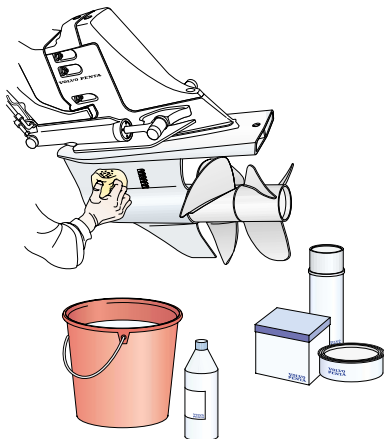
Clean the engine, reverse gear and drive with a degreasing agent. If the paintwork has been damaged, it should be repaired as soon as possible in order to avoid corrosion. A clean engine is easy to work with and any damage or leakage can be discovered quickly.

Flush the drive with fresh water and remove algae and shells. Pay particular attention to the areas around the bellows and trim cylinders. Check the whole drive for damaged paintwork. Remove damaged paint and clean down to the bare metal with wet sandpaper. Then paint with Volvo Penta primer and top coat.

**N.B.** It is important to use Genuine Volvo Penta paint, since other paints can contain metals or metal oxides, causing galvanic currents. The sacrificial anodes must not be painted.



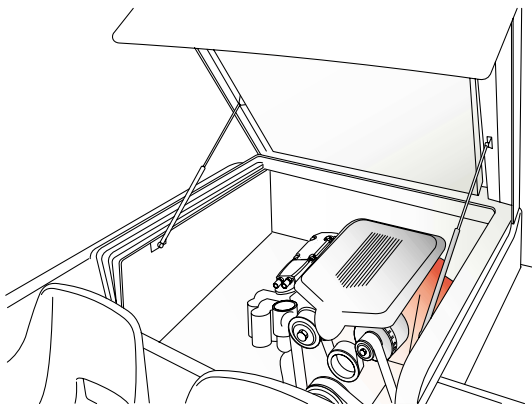
Paint the drive with Volvo Penta anti-fouling paint that is approved for use on aluminium drives.



# VENTILATION

Be careful to ensure good ventilation during the lay-up period. The air must be allowed to circulate throughout the boat. Keep the doors and hatches, including the engine compartment door, open in order to avoid condensation and mould.

Clean the engine compartment. A clean engine compartment is a prerequisite for maximum safety on board, and makes servicing work that much more agreeable.



**⚠ Important!**

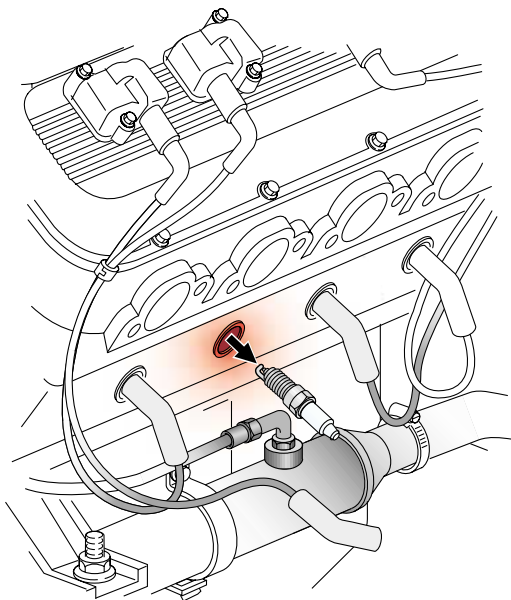
There is an operator's manual, providing you with more detailed information, on each particular engine.

# IGNITION SYSTEM

Maintaining the ignition system is important in order for the engine to run well and consume less fuel. If you do not have the right equipment and knowledge for the job, then all adjustments to the engine ignition system should be carried out by an authorized workshop. Faulty adjustment of the ignition can result in engine damage and reduced fuel economy.

Use Genuine Volvo Penta components for the ignition system; they meet all marine safety requirements.

Make it a rule to change spark plugs at least once every year. This way you will prevent any starting problems, back-firing, etc. The operator's manual shows you what type of spark plug to use.





It is important, from a safety point of view, that all parts are clean and dry.

Clean and dry the ignition cables and distributor cover, loosen the distributor cover and clean and dry inside. Spray inside and outside, using a moisture-repellant spray. Replace any damaged or worn parts.



Install new spark plugs. If the engine is equipped with breaker points, these should be replaced, if necessary. Also

replace the condenser. Clean and dry the ignition cables and distributor cover. Let an authorized Volvo Penta workshop overhaul the ignition point setting, if you do not have access to special tools.

# THE EASY WAY TO DEPENDABLE ENGINES

If you pay attention to simple maintenance jobs on your engine and drive you will reduce your running costs and increase your safety afloat. But it is just as important to ensure that the parts are Genuine Volvo Penta Parts. To locate your nearest Volvo Penta dealer, please go to [www.volvopenta.com](http://www.volvopenta.com)



**VOLVO  
PENTA**

[www.volvopenta.com](http://www.volvopenta.com)