

**VOLVO
PENTA**

OPERATOR'S MANUAL D2





WARNING!

Operating, servicing and maintaining a marine vessel can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead which are known to the State of California to cause cancer and birth defects or other reproductive harm.

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust when operating, servicing and maintaining the engine.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Wear gloves or wash your hands frequently when servicing the vessel.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information

www.P65warnings.ca.gov/marine

www.p65warnings.ca.gov/products/diesel

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Foreword

Welcome!

Congratulations on your new boat equipped with a Volvo Penta marine engine. Volvo Penta engines are designed to fulfill Volvo's core values; quality, safety and environmental care. After more than 100 years as an engine manufacturer, the Volvo Penta brand has also become a symbol of reliability, technical innovation, top-of-the-range performance and long service life. Volvo Penta marine engines are used all over the world, in all possible operating conditions for professional as well as leisure purposes.

Make sure to thoroughly read through this Operator's Manual and take necessary actions regarding running and maintenance before your maiden voyage. It contains the information you need to be able to operate and maintain the engine safely and correctly. Pay careful attention to the safety instructions included in the manual.

As the owner of a Volvo Penta marine engine, you become part of a worldwide network of dealers and service workshops that assist you with technical advice, service requirements and replacement parts. Contact your nearest authorized Volvo Penta dealer for assistance.

It is possible to buy additional literature about your Volvo Penta engine, e.g. the Service & Maintenance manual. More information on how to do this can be found at www.volvopenta.com.

Information about your closest Volvo Penta dealer and other useful news and information can be found at www.volvopenta.com and by following Volvo Penta on Facebook.



www.volvopenta.com



www.facebook.com/volvopenta

Safety Information

This chapter describes how safety precautions are presented in the manual and on the product. Read the chapter through very carefully before you start the engine or do any maintenance or service. It has to do with your safety; an incorrect operation can lead to personal injury and damage to products or property. It also gives you an introduction to the basic safety rules for using and looking after the engine.

If anything remains unclear or if you are unsure of something, contact your Volvo Penta dealer for assistance.

IMPORTANT:

Always follow local safety instructions and regulations.

Safety texts have the following order of priority:

DANGER!

Indicates a hazardous situation, which, if not avoided, result in death or serious injury.

WARNING!

Indicates a hazardous situation, which, if not avoided, could result in death or serious personal injury.

CAUTION!

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate personal injury.

IMPORTANT:

Indicates a situation, which, if not avoided, could result in property damage.

NOTICE! Used to draw attention to important information that facilitates work or operations.



This symbol is may be used on the product to call your attention to the fact that this is safety information. Always read such information very carefully.

Make sure that warning and information symbols on the engine are clearly visible and legible. Replace symbols that have been damaged or have been painted over.



In some cases, this symbol is used on our products and refers to important information in the Operator's Manual.

Most chemicals such as engine and transmission oils, glycol, petrol and diesel oil and chemicals used in workshops such as degreasing agents, paint and solvents are harmful to health.

Carefully read the instructions on the product packaging! Always follow the safety regulations, such as the use of protective masks, goggles, gloves, etc. Make sure that other personnel are not exposed to substances that are hazardous to health. Ensure good ventilation.

Manage used and leftover chemicals in the prescribed manner.

Daily Checks

▲ WARNING!

Do not start the engine if there is reason to suspect fuel leaks or if there is explosive material nearby.

Make it a habit to give the engine and engine compartment a visual check before the engine is started and after operations, once the engine has stopped. This helps you to quickly discover fuel, coolant or oil leakages or any other abnormality that has occurred, or is about to occur.

Personal safety equipment

▲ CAUTION!

Always use appropriate safety equipment. Personal protective equipment does not eliminate the risk of injury but it will reduce the degree of injury if an accident does happen.

Some examples are ear protection, eye and face protection, protective footwear, personal protective equipment, head protection, protective clothing, gloves and respirators.

▲ WARNING!

Ensure that all machine guards and safety devices are in place and are functional.

▲ CAUTION!

Never use tools or products that show signs of damage.



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Protect your eyes

⚠ CAUTION!

Wear safety glasses.

Always wear safety glasses if there is a risk of splintering, sparks and spray from the electrolyte (so-called battery acid), or other chemicals. Your eyes are very delicate and damage can result in loss of sight!

Protect your skin

⚠ CAUTION!

Risk of skin damage.

Avoid getting oil on your skin! Prolonged or repeated exposure to oil can dry out the skin. Thereafter, irritation, dryness and eczema and other skin problems may occur.

Use protective gloves and avoid oil-soaked clothes and rags. Wash regularly, especially before eating. Wear suitable protective creams to prevent skin from drying out and to facilitate cleaning.

Fire safety

⚠ WARNING!

Fire and Explosion Risk!

Accidental spark could ignite fuel vapors.

All fuels – as well as many lubricants and chemicals – are flammable. Do not allow open flames or sparks near them. **Smoking forbidden!** Hydrogen from the batteries is also very flammable and explosive in certain mixture with air.

Ensure that the workplace is well ventilated and take the necessary precautions before welding or grinding begins. Always ensure that there is a fire extinguisher close at hand in the work area.



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Spare parts — safety

▲ WARNING!

Always use spare parts with the same quality as genuine Volvo Penta parts to minimize the risk of an explosion or fire.

Components in fuel systems and electrical systems on Volvo Penta engines are designed and manufactured to minimize the risk of explosions and fire, in accordance with applicable legal requirements.

Used oils, filters and chemicals etc.

▲ WARNING!

Risk of fire.

Store fuel soaked rags and other flammable material so that there is no danger of them catching fire.

Oil-soaked rags can spontaneously ignite under certain circumstances.

IMPORTANT:

Used fuel and oil filters are environmentally hazardous waste and must be taken to an approved waste management facility for correct handling, as must any used lubricating oil, contaminated fuel, paint residue, solvents, degreasers and wash residue.

Prevent start of the engine

▲ WARNING!

Immobilize the engine by turning off the power supply with the main switch(es) and lock it (them) in the off position before starting work. Place a warning notice at the main switch.

If the engine is equipped with BMS (Battery Management System), always disconnect both battery cables from the battery terminals.

Ventilation when running the engine

▲ WARNING!

Only start the engine in a well-ventilated area. If operating the engine in a closed area ensure that there is exhaust ventilation leading out of the work area to remove exhaust gases and crankcase ventilation emissions.

The engine must not be operated in areas where there are explosive materials or stored gas.



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Rotating parts and hot surfaces

⚠ DANGER!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.

If the engine is in operation and operates another device, you must not, under any circumstances, stay close to the engine.

Work on running engines is strictly prohibited. There are however adjustments that require the engine to be run. Approaching a running engine is a safety risk. Loose clothing and long hair can get caught in the rotating parts; careless movements or a dropped tool can lead to serious personal injury.

Be careful to avoid hot surfaces (exhaust pipes, turbochargers, charge air manifolds, start elements etc.) and hot fluids in pipes and hoses on engines that are running or have just stopped. Re-install all protective covers that were removed during maintenance work before starting the engine.

Information on the engine

IMPORTANT:

Make sure that all warning and information decals on the product are always visible. Replace decals which have been damaged or painted over.



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Prohibition on use of start spray

⚠ WARNING!

Never use start spray or similar agents to start an engine. This may cause an explosion in the inlet manifold. Risk of personal injury.



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Before start of engine

⚠ WARNING!

Never start the engine if there is reason to suspect fuel and/or gas leaks, or if there is explosive material nearby.

IMPORTANT:

Only start the engine with the air filter and protective caps fitted. Foreign objects in the inlet line could cause machine damage. Also make sure that no tools or other parts have been left next to the engine.

⚠ WARNING!

Never start the engine with the valve cover removed. There is a risk of personal injury. For engines with turbochargers, the rotating compressor turbine can in addition cause serious personal injuries.

Before any work on the electrical system

⚠ WARNING!

Always stop the engine first. Then disconnect the current at the main switches and any external power supply before working on the electrical system – to minimize the risk of electrical hazards.

IMPORTANT:

Never disconnect the current using the main switches when the engine is running or by disconnecting the battery cables. The alternator and electronics could be damaged.

Avoid damage to the engine control module and other electronics

IMPORTANT:

Switch off the main switch before connecting or disconnecting a connector.

Before welding work

IMPORTANT:

Before any work with electric weld can begin, the connection to all control units must be disconnected. After finished welding, re-connect the connection to all control units before connecting any battery cable.

Before any work on the cooling system

⚠ WARNING!

Stop the engine and let it cool before starting work on the cooling system. Hot fluids and hot surfaces can cause burns.



P0024484

Risk of water penetration/sinking

⚠ WARNING!

If a launched boat is equipped with sea water tap and safety valve, **ensure that these are closed** before any work is allowed to begin on the cooling system. Remember to open the tap and valve before starting the engine!

Hot coolant under pressure

⚠ CAUTION!

Hot coolant can cause burns. Avoid opening the filler cap for the coolant when the engine is still hot. Steam or hot coolant can spray out and system pressure is lost.

Open the filler cap slowly and release the pressure in the cooling system if the filler cap or valve must be opened – or if a plug or a coolant hose must be removed from a hot engine.

Hot oil under pressure

⚠ CAUTION!

Hot oil can cause burns. Avoid getting hot oil on the skin. Ensure that the lubrication system is not pressurized before starting any work. Never start or operate the engine without the oil filler cap is on. There is a risk that hot oil can spray out.

Refueling

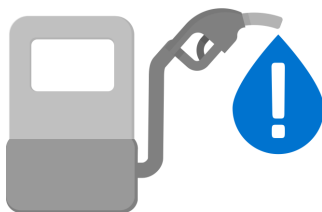
⚠ WARNING!

There is always a risk of fire and explosion during refueling. Smoking is forbidden and the engine must be stopped.

Proper fuel quality

IMPORTANT:

Always use the fuel recommended by Volvo Penta. See *Technical Data* in Operator’s Manual. Other fuel can damage the engine. Wrong fuel quality can also lead to higher service costs.



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⚠ WARNING!

Risk of personal injury. Wrong fuel quality in a diesel engine can cause the fuel control mechanism to bind which can cause the engine to overspeed!

Legal requirements to use proper fuel

IMPORTANT:

To meet regulatory requirements for certified emission levels must always recommended fuel according to *Technical Data* in the Operator's Manual be used.

At any leak detection on the fuel system

⚠ WARNING!

Wear safety goggles!

Be extremely careful when searching for leaks in the fuel system high-pressure circuits. There is very high pressure in the jet from pipes and injectors. The fuel may penetrate the tissue and cause serious risk of blood infection (septicemia).



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Handling of fuel pipes

IMPORTANT:

High pressure pipes for fuel must not be bent or straightened under any circumstances. Cracks may occur. Damaged pipes must be replaced.

Safe handling of batteries

⚠ WARNING!

Risk of fire and explosion. Never allow an open flame or electric sparks near the batteries.

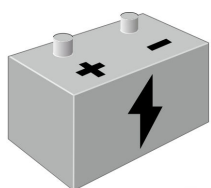
A spark caused by an incorrectly connected battery can be enough for the battery to explode with serious injuries.

Do not touch the connections during start attempts. Sparking hazard! Do not lean over batteries.

Correct polarity of the batteries

IMPORTANT:

Make sure that the positive (+) and negative (-) battery cables are correctly connected to the corresponding battery terminals. Wrong connection may cause severe damage to electrical equipment.



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Risks of electrolyte in batteries

⚠ WARNING!

Always wear protective goggles when charging or handling batteries.

Battery electrolyte is highly corrosive.

Rinse immediately with copious amounts of water if the electrolyte gets in your eyes. Search directly after the rinsing help by medical staff.

If it comes electrolyte to unprotected skin, wash immediately with soap and water.



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Layout of the battery compartment

IMPORTANT:

Make sure the battery compartment is designed according to current safety standards.

Cleaning the engine and components

IMPORTANT:

Never use a high pressure washer for cleaning of engine or engine components.

Cleanliness for sensitive components

IMPORTANT:

Observe meticulous cleanliness when handling system components.

Even minimal amounts of dirt could cause a breakdown.

Adjustment of the clutch

CAUTION!

Clutch adjustments must be carried out with the engine stopped.

Maneuvering

WARNING!

A rotating propeller can cause serious injury. Check that nobody is in the water before engaging ahead or astern. Never drive near bathers or in areas where people could be in the water.

To avoid passengers falling overboard, refrain from extreme and sudden rudder movements and ahead/astern movements.

Lanyard switch

We recommend installing and using a lanyard switch (optional), especially if the boat is capable of high speeds. The lanyard switch stops the engine if the driver loses control of the boat.

Accidents at sea

Maritime rescue statistics show that a large number of boat accidents are caused by inadequate engine and boat maintenance and the lack of safety equipment. Make sure that the boat engine is properly maintained by making sure that the recommended service is performed, and that necessary safety equipment is available and functional.

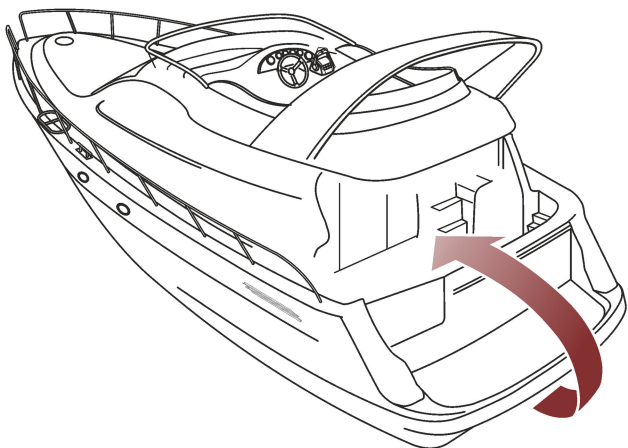
Stern turbulence

▲ WARNING!

Carbon Monoxide Poisoning. When the boat moves forward, an area of lower pressure air is formed behind the boat — so-called turbulence. In certain conditions, this turbulence can be powerful enough to draw the exhaust fumes into the cockpit or cabin, creating a risk of carbon monoxide poisoning to people on board.

The turbulence problem is most pronounced on tall, broad-beamed boats with a transom stern. But even for other boat types, low-pressure suction can be a problem in certain conditions, such as driving with cockpit awnings rigged. Other factors that can increase the effect of turbulence are wind conditions, load distribution, swell, trim, open hatches and ventilators etc.

Most modern boats are, however, designed so that the problem of low-pressure suction is very rare. Should turbulence nevertheless occur, hatches or ventilators must not be opened since this might exacerbate the problem. Instead, try to change the speed, trim or load distribution. If possible, take down or open the cockpit awning. Contact your boat dealer for the best solution for your boat.



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To remember before the boat trip

The lists below includes some tips on what to remember to bring on any boat trip. The list can be extended since the need for safety equipment varies with the boat type and where or how it is used etc. We recommend you ask a regional boat or sea safety organization for more detailed maritime safety information.

- Take your chart out and study your planned route. Calculate distance and fuel consumption. Listen to weather reports.
- Tell your friends/relatives about route plans if you undertake a long journey. Remember to notify changed plans or delays.
- Inform everybody aboard about where the safety equipment is located, and how it works. Make sure that there is more than one person aboard who can start and operate the boat safely.

Safety Equipment:

- life jackets
- communication equipment
- emergency rockets
- approved fire extinguisher
- first aid kit
- life buoy

- anchor
- paddle
- flashlights

Spare Parts and Tools:

- impeller
- fuel filters
- fuses
- tape
- hose clamps
- engine oil
- other tools that may be required

Introduction

Check that you have received the correct operator's manual before continuing reading. If not, please contact your Volvo Penta dealer. Read the Operator's Manual carefully and learn to handle the engine, controls and other equipment in a safe manner before you start the engine.

For engine designations, refer to *Technical Data, page 81*. The designation is stated on the engine plate, refer to *Technical Data, page 87*.

The illustrations in this book may cover several product types, which means that there may be slight differences between the illustrations and the purchased product. This does, however, not affect the validity of the information and/or instructions in the manual. Volvo Penta reserves the right to make alterations to specifications, design features, and illustrations without prior notice.

At service, software can be updated that affects the functionality described in this manual.

About this Manual

This Operator's Manual has been prepared to give you the greatest possible benefit from your Volvo Penta marine engine. It contains necessary information regarding safe and correct engine operation and maintenance.

Always have the Operator's Manual available. Store it safely and do not forget to hand it over to the next owner if you sell your boat.

Warranty

Your new Volvo Penta marine engine is covered by a limited warranty, subject to the conditions compiled in the Warranty Information. Note that AB Volvo Penta's liability is limited to the specification in the Warranty Information and Emission Control System Warranty Statement.

Volvo Penta warranty terms and conditions can be found via <http://manual.volvopenta.com/coupon/>. Use the publication number (at the bottom of each page) of this the manual as reference number.

Read the information carefully, as soon as possible after delivery. It includes important information about service and maintenance; the owner is responsible for being familiar with, checking and implementing these. Otherwise AB Volvo Penta may deny its warranty obligations in part or in full.

NOTICE! Make sure that a Commissioning has been carried out on your Volvo Penta engine. This should be done together with your Volvo Penta dealer when finalizing the purchase. Without a proper Commissioning registration the warranty will not be valid.

Contact your Volvo Penta dealer if you have not received the Warranty Information or Service Book.

Your New Boat

Carefully read through the instructions and other information that is delivered with the new boat. Learn to handle the engine, controls and other equipment in a safe and proper manner. If this is your first boat or if the boat type is unfamiliar to you, we recommend that you practice maneuvering the boat before casting off on the maiden voyage. Make yourself familiar with the boat's seakeeping and maneuvering qualities at different speeds, sea states and load conditions.

Bear in mind that a person in charge of a boat under way bears the legal responsibility of knowing and following the regulations for passage and safety afloat. Learn which regulations apply to you and your waters by contacting the relevant authorities or maritime safety organization. We recommend that you complete a boat driver's course.

Running in the engine

The engine must be run in during the first 10 hours of operation. Do this by using the engine in normal operation, where full load is only applied for short periods of time. Never run the engine at constant speed for any longer periods of time.

Since oil consumption is higher during the running in period, be sure to control the oil level more frequently than normally recommended. See *Maintenance* for more information.

Fuel, oils and coolant

Only use the fuels and oils recommended in the Operator's Manual, other viscosity and quality may cause malfunctions, increased fuel consumption and possibly shorten the life of the engine.

Always change the oil, oil filters and fuel filters at the specified maintenance intervals.

Make sure to always use suitable and correctly mixed coolant.

If an unsuitable coolant has been used, or if the instructions for coolant mixture have not been followed, future warranty claims related to engine and accessories may be denied.

Maintenance and replacement parts

Volvo Penta engines are designed for maximum reliability and long life and built to withstand a demanding environment. The engines are also designed to have a minimal environmental impact. These qualities will be maintained through regular servicing and the use of spare parts with the same quality as genuine Volvo Penta parts. If reliable and purpose-built parts are not used, your safety, health, and the machine's function may be compromised. Volvo Penta has a world-wide network of authorized dealers.

The authorized dealers are Volvo Penta product specialists, and have the accessories, genuine parts, test equipment and special tools needed for high quality service and repair work. Always observe the maintenance intervals in the manual, the complete Service Protocol can be found at volvopenta.com. Remember to note the engine / transmission identification number when you **order service and spare parts**.

Excessive strain on a product and components

Volvo Penta products and components are not dimensioned for external loads. Never stand or step onto an engine, transmission or its components. Loads can bring about damage and the malfunction of a product or property.

Volvo Penta EVC system, integrity and modification

The Electronic Vessel Control (EVC) system is a complete vessel control system for engine, gear and vessel steering control. Modifying the EVC system or connecting spare parts or systems that do not comply with the quality of genuine Volvo Penta parts may adversely affect the system performance, safety and warranty coverage.

Volvo Penta recommends only the use of electronic systems and spare parts with the same quality as genuine Volvo Penta parts. Contact your local Volvo Penta dealer for detailed information and advice.

Environmental care

Environmental care is a core value at Volvo Penta. Energy efficiency and low emissions are among the most important product related aspects and priority focus areas for Volvo Penta business. Several of the global challenges the world faces are directly or indirectly related to power industries and transports. We recognize that Volvo Penta is part of the environmental problems, but we are also convinced that we are a part of the solution.

Volvo Penta currently has a broad engine program in which great advances have been made in reducing exhaust emissions in the same time as the fuel consumption has been improved. Through regular maintenance, the Volvo Penta engines retain its low fuel consumption and low emissions. We hope that you will be keen to preserve these qualities.

Always follow the directions in the Operator's Manual regarding fuel grades, operation and maintenance to avoid unnecessary environmental impact. Contact your Volvo Penta dealer if you notice any changes such as increased fuel consumption or exhaust smoke.

Remember always to hand in environmental hazardous waste such as drained oil, coolant, old batteries, etc. for treatment at a recycling facility. Our united efforts can make a valuable contribution to the environment.

Recording engine data

One or more computers in your Volvo Penta engine can record detailed information. Data — such as usage and information of other systems and modules on the engine — can be included. This data can include information such as boat position and usage. Only a limited amount of data can be stored.

AB Volvo Penta and authorized workshops will not distribute this stored information without permission. AB Volvo Penta may, however, be forced to provide this information if required by national legislation. In general, AB Volvo Penta and authorised workshops may read and use the information.

Certified Engines

If you own an emission-certified engine used in an area where exhaust emissions are regulated by law, this places special demands on the care and maintenance you provide your engine.

NOTICE! Neglects or failure to follow the points listed here may invalidate the engine emission certificate. This means AB Volvo Penta can no longer guarantee engine conformity with the certified model. Volvo Penta is not responsible for damages or costs arising as a result of this.

- Certification means that an engine type has been checked and approved by the relevant authority. The engine manufacturer guarantees that all engines of the same type are equivalent to the certified engine.
- It is the responsibility of the operator/user to ensure that no intentional misuse of the engine takes place.
- Volvo Penta maintenance and service intervals must be complied with.
- Any case of malfunction must be rectified without delay.
- Only use genuine Volvo Penta parts or spare parts with the same quality as genuine Volvo Penta parts.
- Volvo Penta recommends that service to injection pumps, pump settings and injectors always are carried out by a qualified workshop.
- The engine must not be converted or modified in any way, except with accessories and service kits that Volvo Penta has approved for the engine.
- No installation changes to the exhaust pipe and engine air inlet ducts may be made.
- No warranty seals (where present on the product) may be broken by unauthorized persons.
- The general instructions in the Operator's Manual concerning operation, service and maintenance apply.

Volvo Penta Dealer Network

The Volvo Penta global network of authorized dealers is at your service. We strongly recommend that you take your product to an authorized Volvo Penta dealer for service and repair. They are specialists in Volvo Penta products and have the accessories, genuine Volvo Penta parts, the special tools and the latest service information for high quality service and repair work.

Dealer Locator Services

Locate the nearest Volvo Penta dealer through our dealer locator on www.volvopenta.com or download the dealer locator app to your smartphone.

Volvo Penta Action Service

Our global dealer network, your first line of contact, is backed up by Volvo Penta Action Service, a phone based breakdown and support service providing assistance 24 hours a day, every day of the year.

How it works

A dedicated operator will support you all the way through your case and keep you updated on status and progress.

Whenever on-site assistance or technical support is needed, the operator will put you in contact with the closest Volvo Penta dealer that can support your product.

Phone numbers

Find your Volvo Penta Action Service phone number and more information on www.volvopenta.com.



Instruments and Controls

This chapter describes the instruments, panels and controls Volvo Penta sells for your engine.

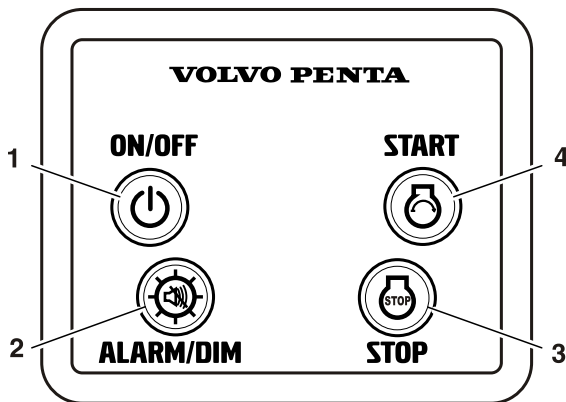
If you would like to complement your instrumentation, or if your boat is equipped with instruments not described here, we ask that you contact your Volvo Penta dealer.

Ignition Lock

The system lacks a start lock. Therefore, the helm station should be lockable, or alternatively a lockable main switch should be fitted, to prevent unauthorized engine start.

Start/Stop Panel

Control Panel



P0016480

On/Off button (1)

Depress the button to start or stop the system.

The panel cannot be switched off when the engine is running.

Start button (4)

When the button is depressed the pre-heat function is activated and the start motor engaged.

Multi-function button (2)

- Confirm the alarm. If an alarm occurs, a flashing warning symbol will be displayed in the tachometer window and an audible alarm will sound. The alarm is confirmed by depressing the multi-function button. The audible alarm is silenced and the warning symbol is lit continuously until the fault is remedied.
- Backlighting. To switch tachometer window backlighting on or off, depress the button for 1 - 5 seconds. The backlighting can be adjusted in five steps by depressing the button for less than 1 second.
- Adjust the tachometer window contrast by holding down the button for more than 5 seconds.

Stop button (3)

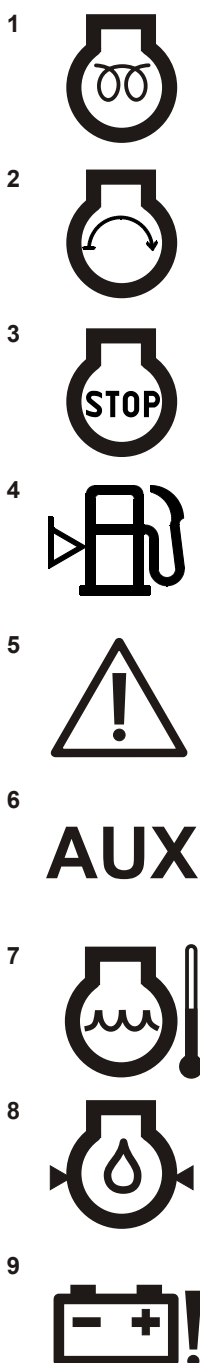
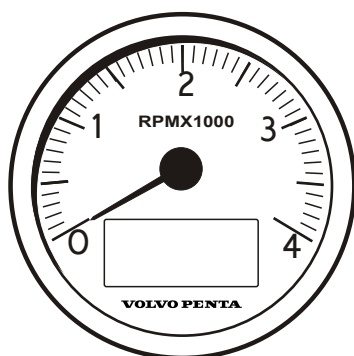
The engine stops running when the button is depressed.

Gauges

Tachometer

The tachometer shows engine speed; multiply the value shown on the dial by 1,000 to get the number of engine revolutions per minute.

Operating information is displayed in the tachometer window.



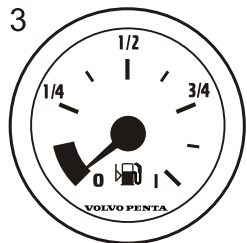
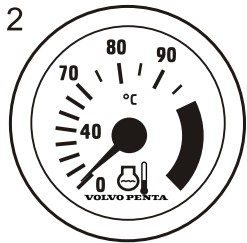
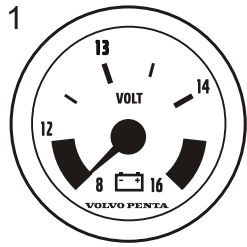
Operating information symbols

- 1 **Pre-heating**
The pre-heat symbol is displayed when the glow function is active.
- 2 **Starting**
The start symbol is displayed when the start motor is engaged.
- 3 **Stopping**
The stop symbol is shown when the stop button is depressed.
- 4 **Fuel level**
If a fuel level sensor is installed (accessory) the fuel level symbol is displayed when there is around 20% of fuel remaining in the tank.
The engine must run for at least one minute before the function is activated.
- 5 **System fault**
The system fault symbol lights up in the case of short circuits or cable breaks.
- 6 **Auxiliary alarm**
Auxiliary alarm for accessory sensors.
- 7 **Coolant temperature**
The coolant temperature symbol lights up if the engine coolant temperature is too high.
- 8 **Oil pressure**
If the oil pressure lamp lights up during operations, the engine oil pressure is too low.
- 9 **Charging**
The charging lamp lights up if the alternator stops charging.

P0007517

Optional instruments

These instruments are sold as engine accessories by Volvo Penta.



1 **Voltmeter, battery charging**

The meter shows the alternator charge current. During operations the charge voltage must be around 14 V. When the engine is stopped and electrical power switched on, battery voltage is around 12 V.

2 **Coolant temperature gauge**

The instrument shows engine coolant temperature. During operations coolant temperature must normally be between 75-95°C (167-203°F).

3 **Fuel level gauge**

The fuel level gauge shows the quantity of remaining fuel.

4 **Alarm monitor**

The alarm monitor gives a visual warning to call attention to any alarms that occur.

P0007518



P0002383

EVC system display

It is possible to present several windows with different operational information in the EVC system display. The various screens are selected using the instrument buttons.

Before the display is put to use certain settings must be entered in the configuration menu; refer to *Configuration menu*.

It is also possible to bring up a menu identical to that shown in the tachometer display by navigating to System information in the *Configuration menu*, or by depressing button 2; refer to *Multi, button 2*.

A self-test is performed at start; the display will emit a constant audible signal if a fault is detected. The display will continue to function, but may behave in unexpected ways.

Only installed functions are shown in the display.

Screens

Depress any of the buttons 1 to 4 to bring up the function menu for the buttons on the lower part of the display.

Buttons 1, 2 and 4 provide different screens.

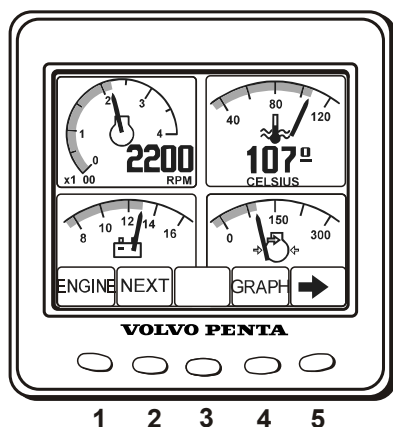
Button 1 – Engine

Button 2 – Multi

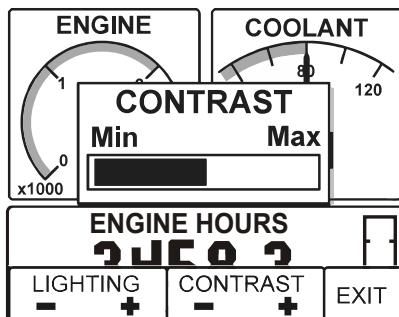
Button 4 – Graph

Use button 5 to adjust contrast and to access the configuration menu for display settings; refer to *Configuration menu*.

Exit the menu by waiting a few seconds or by depressing button 5 (EXIT).



P0001168

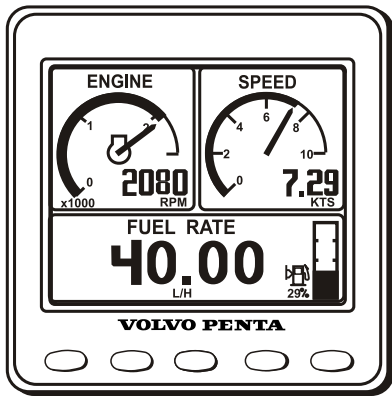


P0003010

Contrast

The display has five contrast settings. Depress button 5 (far right) and change the contrast by depressing + (button 4) or – (button 3).

Store the setting by depressing EXIT (button 5).

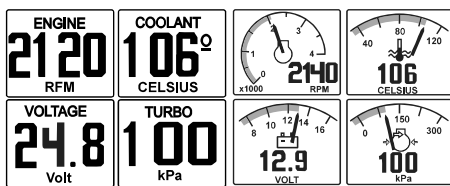


P0002401

Engine, button 1

Engine revolutions and speed are shown in the upper part of the window. Operating hours are displayed in the lower part, along with a fuel level indicator if this function is installed.

If speed information is lacking, coolant temperature will be shown instead.

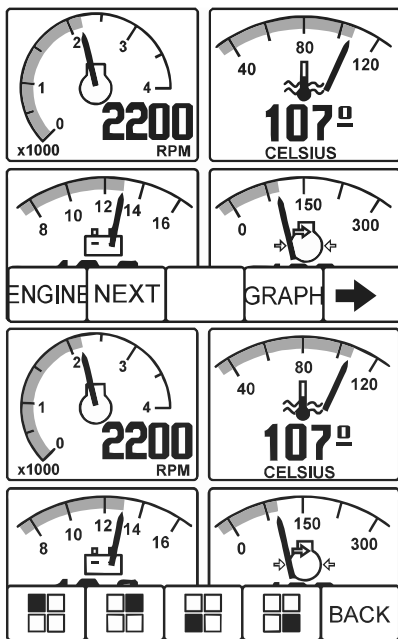


P0007392

Multi, button 2

Operational information is displayed in four analog or digital windows in the multi screen. The display can either show several windows, or be divided so that the lower part shows System information. To switch between the different screens depress button 2 repeatedly.

If the selected information is lacking, the symbol “—” will be displayed: for analog instruments the dial will be absent.

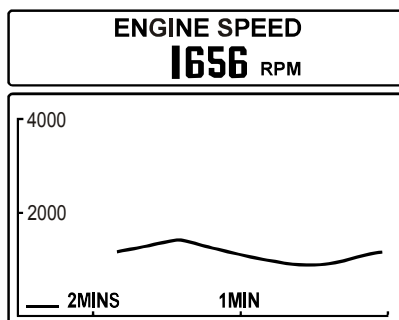


P0003011

Selecting screens

Depress the right arrow (button 5) to select the information to be displayed in each respective window. Then repeatedly depress the button that corresponds to the window to be set until the desired information is shown.

The type of information accessible depends on the type of electrical system and sensors the boat is equipped with.

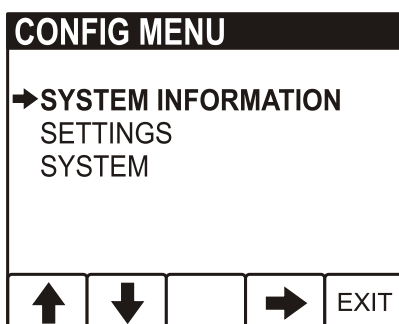


P0002420

Graph, button 4

This screen displays operational information in the form of graphs. Depress button 4 repeatedly to select the information to be displayed. To set the time interval, refer to *Configuration menu*.

If contact with the system is lost, a straight line will proceed across the screen.



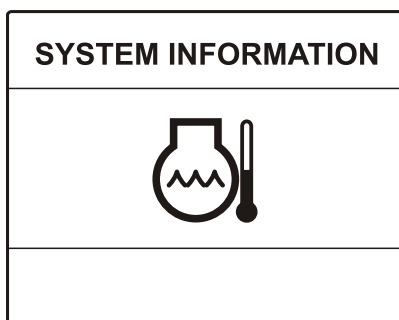
P0002625

Configuration menu

Open the Configuration menu by holding down button 5 for at least 3 seconds. In this screen it is possible to retrieve System information, enter various display settings, calibrate depth compensation and speed and retrieve other system information.

Engine ignition must be switched on when changing display settings or calibrating functions.

Navigate through the menu using the up and down arrows, and select using the right arrow.



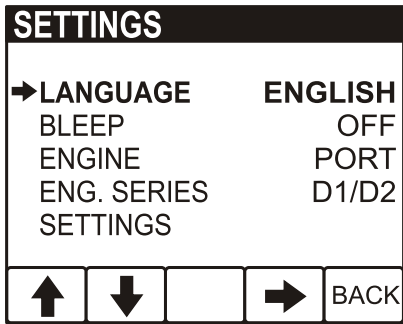
P0002634

System Information

This screen shows the same information as that shown in the tachometer display; refer to *Instruments and Controls, page 23* for further information.

Alarm

When the system detects a fault, the display automatically switches to the System Information screen. For further information, refer to *Fault handling, page 40*.



P0002635

Settings

Language: setting the display language.

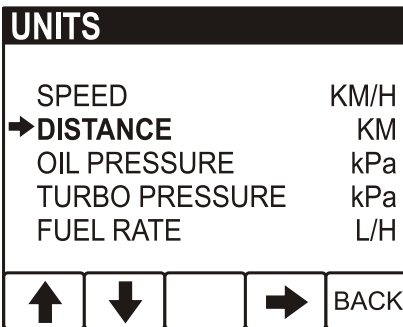
Bleep: setting button bleep On or Off.

Engine: setting the installation the display forms part of, and the engine to be shown in the display (single, port, starboard or twin).

Eng. series: setting the engine series for the display (D1/D2, <D2). The display is factory set for engines larger than D1/D2, therefore the display must be re-set before it can be used on D1/D2 engines.

Display: setting speed indicator and tachometer intervals.

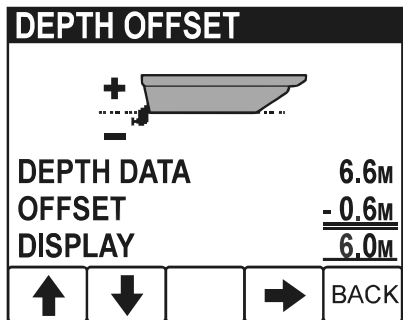
- Rpm intervals, 2500–9000 rpm in 500 rpm stages. Set 4000 rpm.
- Speed, on/off.
- Speed intervals, 10–100 knots in 10 knot stages.
- Graph intervals: 2 min, 10 min, 30 min, 60 min, 2 h, 4 h or 8 h.
- Speed (Speed): KNOTS, MPH, KM/H



P0002409

Units: Selection of operational information units to be shown (this menu is only displayed if “Local” is selected in the settings menu: “Local” must always be selected for D1/D2 engines).

- Distance: NM, MILE, KM
- Oil pressure/Turbo pressure: kPa, psi
- Fuel rate: L/H, GAL/H, IGAL/H
- Temperature: °C, °F



P0003002

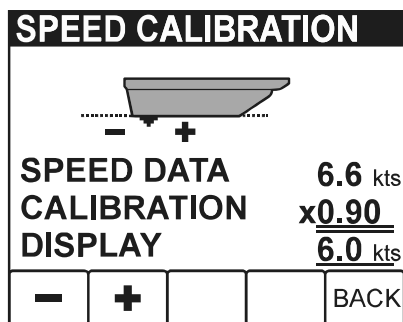
Calibration: the engine must be switched on during calibration.

Depth compensation

Setting the Volvo Penta echo sounder. The echo-sounder can be installed anywhere between the waterline and the boat's deepest point. Set the deviation – off set – so that the display value shows one of these points.

To adjust the value up (+), set the distance between the echo-sounder and the waterline; to adjust the value down (–), set the distance between the echo-sounder and the boat's deepest point. The value can be set in 0.1 unit stages.

Store the set value by depressing BACK (button 5).



P0003005

Speed factor

The speed factor must be set while the boat is under way. Compare the displayed boat speed value with GPS data (or another boat) and adjust the speed factor until the values agree.

The speed sensor calibration value can be adjusted upwards (+) or downwards (-) in stages of 0.01 units (+ or - 1%). Store the adjusted value by depressing BACK (button 5).

Controls

This section describes the controls Volvo Penta sells for your engine. Contact your dealer if your boat is equipped with controls other than those described here, and you feel uncertain about their function.

Maneuvering

A single-lever control operates both gearshift and throttle functions from the same lever.

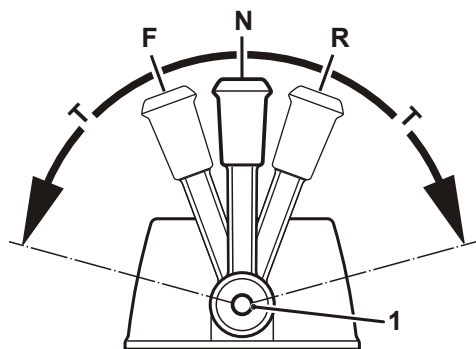
The engine can only be started with the control lever in the neutral position.

N = Neutral position. Reverse gear/drive disengaged and engine at idle.

F = Reverse gear/drive engaged for movement ahead.

R = Reverse gear/drive engaged for movement astern.

T = Engine rpm control (throttle).



P0002427

Disconnecting the gearshift function

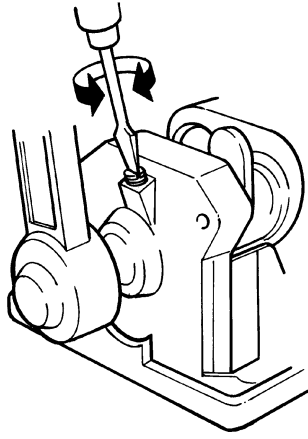
The gearshift function can be disconnected so that the control lever only operates the throttle.

- 1 Put the control lever in neutral (**N**).
- 2 Depress the neutral button (**1**), and keep it depressed at the same time as the lever is moved forward.
- 3 Release the neutral button, the shift function is disengaged and the lever only influences engine revolutions.

The gear shift function is reconnected automatically when the lever is returned to the neutral position.

CAUTION!

Take care not to engage the gear by mistake.



P0002429

Adjusting the friction brake

The lever is fitted with a friction brake to allow adjustment for easier or stiffer movement as required. The friction brake only affects movement of the throttle control lever.

- 1 Lift away the cover from the control. On side-mounted controls the lever must be removed first.
- 2 Move the lever to the half throttle/astern position.
- 3 Adjust the friction brake by turning the screw clockwise (+) for stiffer lever movement, and counterclockwise (-) for easier movement.
- 4 Replace the cover and the lever.

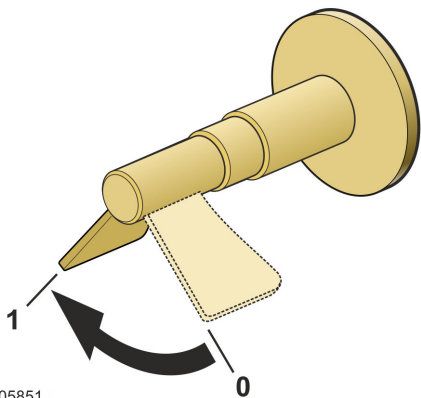
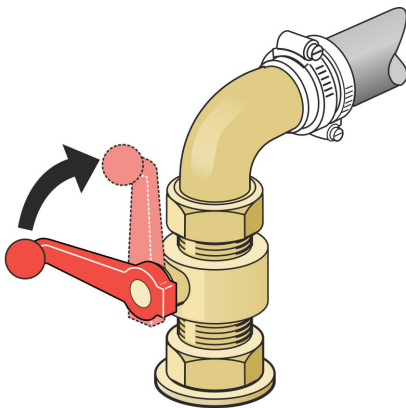
Starting

Make a habit of visually checking the engine, engine bay and transmission before start. This will help you to discover quickly if anything abnormal has occurred, or is about to occur. Also check that instruments and warning displays show normal values when you have started the engine.

To minimize cold start smoke we recommend you install an engine heater or engine bay heater if temperatures below +5°C (41°F) are encountered.

▲ WARNING!

Never use start spray or similar agents to start an engine. This may cause an explosion in the inlet manifold. Risk of personal injury.



Before Starting

- Check the engine and transmission oil levels.
- Check coolant level.
- Open the sea cock.
- Open the fuel cock.
- Turn the main switch(es) on.

IMPORTANT:

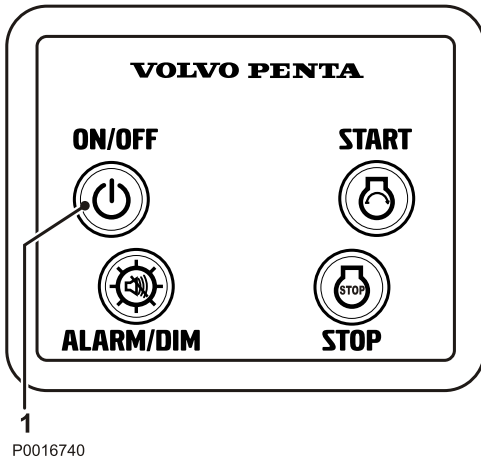
Never disconnect the current using the main switches when the engine is running or by disconnecting the battery cables.

The alternator and electronics could be damaged.

- Start the engine bay fan, where fitted, and allow it to run for at least four minutes.
- Check that there is sufficient fuel for the planned trip.

Starting the Engine

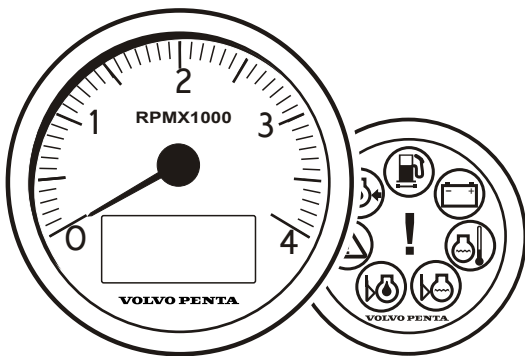
Activate the control panel by depressing the on/off button (1). The Volvo Penta logo is displayed in the window. Two audible signals are sounded to indicate the system is ready and that the engine may be started.



P0016740

Check the tachometer

If an operational fault occurs an audible alarm will sound and a symbol will flash in the tachometer window. Refer to the *Fault handling, page 40* chapter for more detailed information and recommended actions.



P0008437

Check the alarm instrument (accessory).

The lamps in the alarm instrument light up each time the ignition is turned on. Check that all lamps light up and then extinguish. If any lamp flashes, a fault has been registered; refer to the *Fault handling, page 40* chapter for more detailed information and recommended actions.

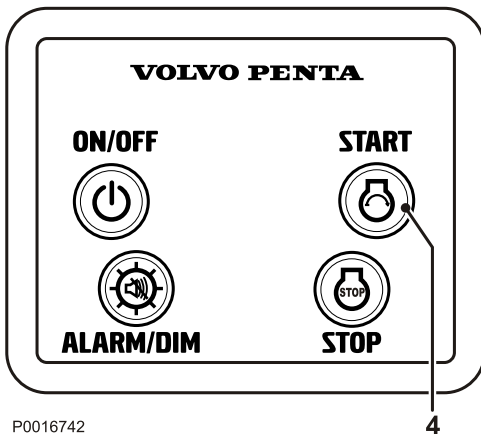
Start the engine

Press the start button (4). Release the start button as soon as the engine starts.

The pre-heating symbol is displayed in the tachometer window. Pre-heating is automatic and lasts for 20 seconds.

Pre-heating only takes place if engine temperature is below 50° (122° F).

Pre-heating may be activated before the engine is started by depressing the start button (4) for a short moment. Pre-heating will continue for 20 seconds. The pre-heating symbol is displayed in the tachometer window.



P0016742

Overheating Protection

If the starter motor is engaged for its maximum activation time (30 seconds), the starter motor circuit is cut automatically to protect the starter motor from overheating. If possible, leave the starter motor to cool for at least five minutes before making a new start attempt.

Read off the instruments and warm up the engine

Allow the engine to idle for the first 10 seconds. Read off the instruments and check that they show normal values. Check that no warning lamps are flashing. If any lamp flashes, a fault has been registered; refer to the *Fault handling, page 40* chapter for more detailed information and recommended actions.

Warm up the engine at low speed and low load, so that normal working temperature is reached before full power is applied.

Operation

Learn to handle the engine, controls and other equipment in a safe and proper manner before casting off on your maiden voyage. Remember to avoid sudden and extreme rudder maneuvers and gear shifts. There is a risk for passengers and crew falling over or falling overboard.

⚠ WARNING!

A rotating propeller can cause serious injury. Check that nobody is in the water before engaging ahead or astern. Never drive near bathers or in areas where people could be in the water.

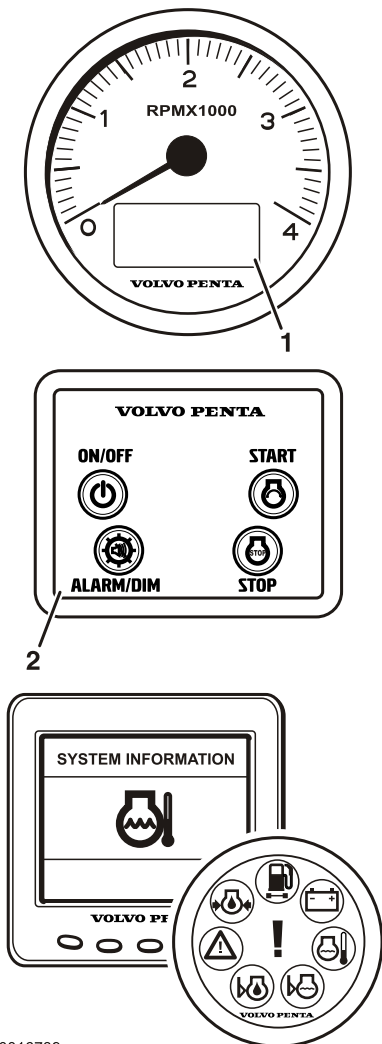
Reading the Instruments

Read off the instruments and alarm display immediately after start, and then regularly during operation.

Alarms

If an alarm is tripped, an audible alarm will sound and a symbol will flash in the tachometer window (1). If optional equipment such as alarm instruments or an EVC display are installed, the relevant warning lamp will flash there also.

- 1 Reduce engine speed to idle.
- 2 Cancel the alarm by depressing the multi-function button (2).
The audible alarm will be silenced. The symbol will be lit continuously until the fault is remedied
- 3 Take the necessary action: refer to the *Fault handling*, page 40 section.



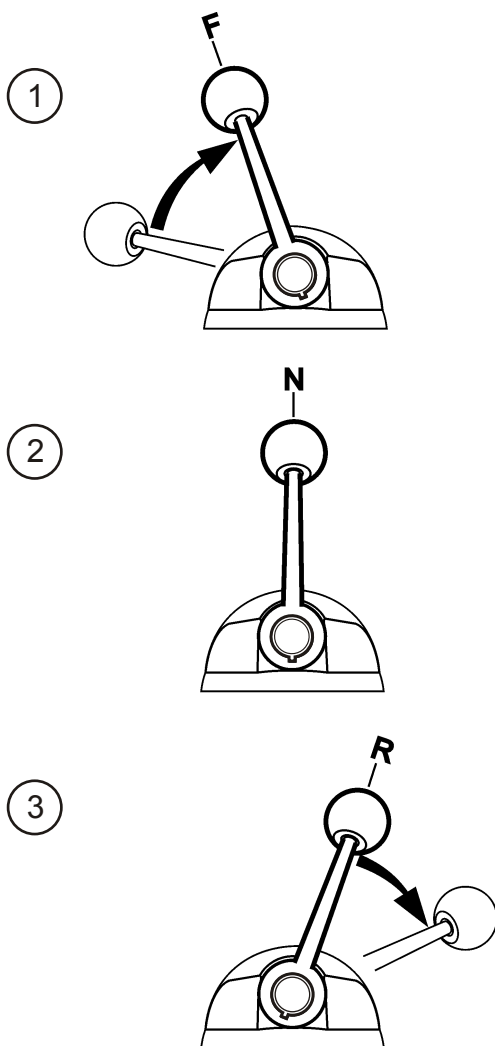
P0016739

Maneuvering

Shifting between ahead and astern must be done at idle revolutions. Shifting at higher revolutions can be uncomfortable for those on board and cause unnecessary stress to the transmission or make the engine stall.

Always shift between ahead and astern in the following manner:

- 1 Reduce engine revolutions to idle and allow the boat to lose most of its speed.
- 2 Move the control lever to the neutral position with a quick, firm movement. Pause a moment.
- 3 Move the control lever back with a quick, firm movement and increase revolutions.



P0005856

Sailing

When sailing, set the control lever to astern if a folding propeller is fitted.

If a fixed propeller is fitted the control lever should be set to neutral or reverse. When using a fixed propeller and sailing with the control lever set to reverse the speed is slowed down though less noise is being made.

IMPORTANT:

If a fixed propeller is fitted, to avoid problems with the transmission system the engine needs to be started and kept running for five minutes every fourth hour of sailing. The control lever must be set to neutral during the whole procedure.

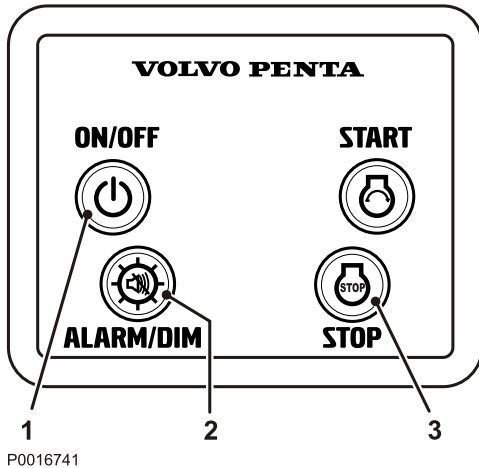
Cruising Speed

Avoid operations at full throttle for best fuel economy. We recommend a cruising speed that is around 500-1000 rpm below the maximum rpm at top speed (full throttle).

Depending on the type of hull, choice of propeller, load and sea state etc., maximum revolutions at top speed may vary, but should be within the full throttle range; refer to the *Engines* section.

Engine Shutdown

Allow the engine to run at low idle, in neutral, for a few minutes after operations are completed. In this way after-boiling is avoided at the same time as temperature equalization takes place. This is especially important when the engine has been run under heavy load at high rpm .



Stop the Engine

Press the Stop button (3) until the engine stops running.

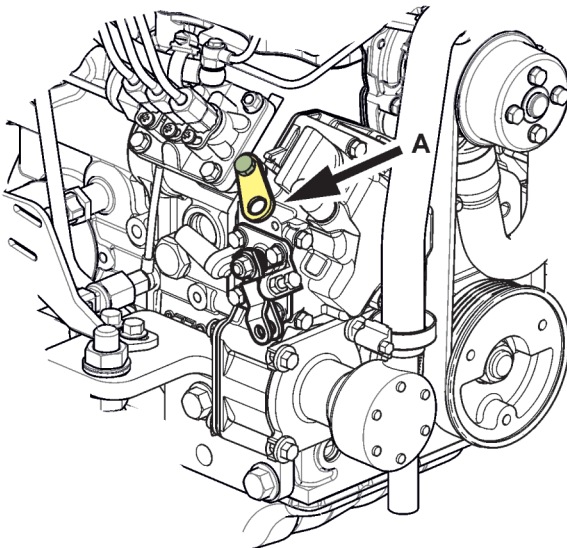
Press the On/Off button (1) to cut the power to the system.

If the engine is stopped and the ignition still turned on, an alarm sounds after 10 seconds to prevent the ignition is left on unintentionally and the battery will become discharged.

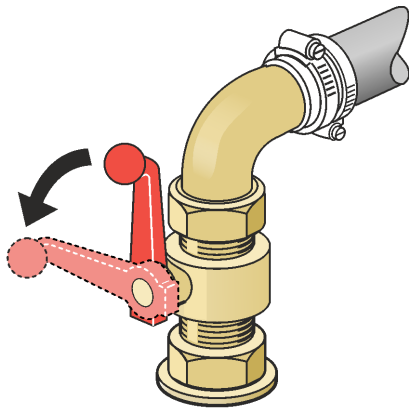
Silence the alarm by turning the ignition off, or reset the alarm with the multifunction button (2) if the ignition is to be turned on.

Auxiliary stop

If the engine cannot be stopped in a normal procedure, it is possible to stop the engine via the auxiliary stop (A) mounted on the side of the engine.



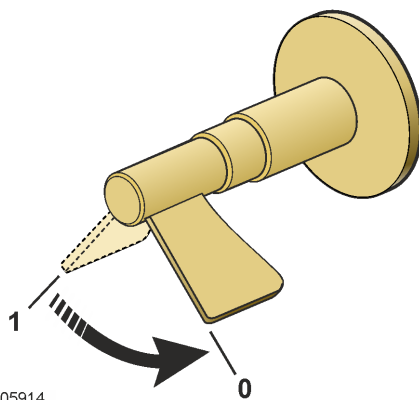
After Engine Shutdown



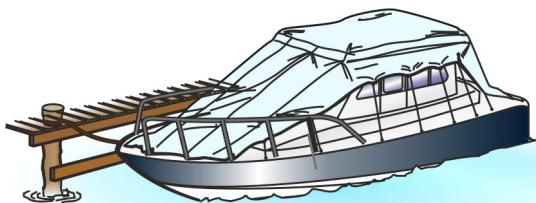
- Check the engine and engine bay for leakages.
- Close the fuel tap.
- Close the sea cock where fitted.
- Boats with stern drives: Trim the stern drive down to maximum to protect the trim ram piston's untreated surfaces from fouling.
If there is a risk of the boat striking bottom with the stern drive, the drive must instead be trimmed up to the maximum lift position.
- Turn off the main power switch before any long stoppage.

NOTICE! Do not turn off the main power switch within 30 seconds after turning off the ignition. This in order to save engine data to the engine control unit.

NOTICE! Depending on the model and setup, there could be more than one switch.



P0005914



P0002451

Operation break with the boat in water

If the boat is not used, but left in the water, the engine must be warmed up at least once every fortnight. This prevents corrosion damage in the engine.

If you expect the boat to be unused for two months or more, it must be inhibited, please refer to *Storage, page 77*

Operation break with the boat out of water

Where boats are kept laid up on land when not in use, there is a lower level of galvanic corrosion protection due to oxidation on the sacrificial anodes. Before launching the boat the sacrificial anodes on the drive and shield must be cleaned with emery paper to remove any oxidation.

If you expect the boat to be unused for two months or more, it must be inhibited, please refer to *Storage, page 77*.

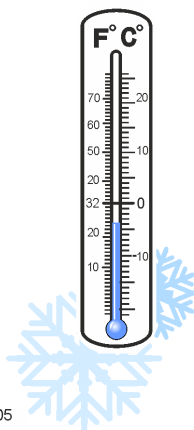
IMPORTANT:

Use emery paper. Do not use a wire brush or other steel tools when cleaning, as these may damage the galvanic protection.

Cold Weather Precautions

If the engine bay cannot be kept frost free, the sea water system must be drained and the freshwater system coolant must have sufficient freeze protection to prevent freeze bursting; refer to *Maintenance, page 57* and *Seawater System, Draining, page 62* respectively for more detailed information.

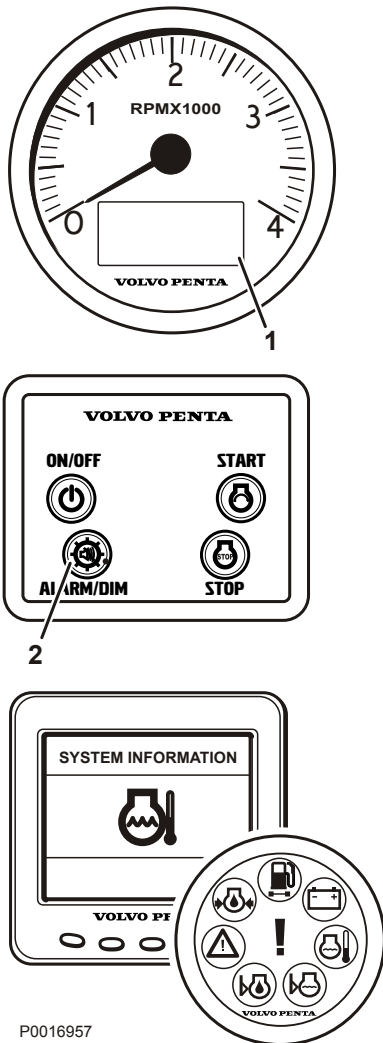
Check the charge status of the battery. A poorly-charged battery can freeze and burst.



P0005905

Fault handling

Despite regular maintenance according to the maintenance schedule and perfect operation conditions, faults that need to be attended to during travel, may occur. This chapter describes some possible alarms and fault handling. Note that the content of this chapter does not provide full coverage of the possible fault messages and alarms. Contact a Volvo Penta workshop for assistance with diagnostic readouts and unresolved faults.



P0016957

If an operational fault arises an audible alarm will sound and a symbol will flash in the tachometer window(1) If optional equipment such as an alarm monitor or an EVC display are installed, the relevant warning lamp will flash there also.

Cancel the alarm by depressing the multi-function button (2). The audible alarm will be silenced. The symbol will be lit continuously until the fault is remedied.

This chapter describes faults and actions to be taken.

⚠ CAUTION!

Read the safety precautions for maintenance and service in the Maintenance Safety Information chapter before starting work.

Coolant Temperature

The coolant temperature lamp is lit if the coolant temperature is too high.



IMPORTANT:

Continued operations with too-high engine temperature can cause serious engine damage.

- Check coolant level. Refer to *Coolant Level, Checking and Topping Up*, page 58.
- Check that the raw water filter, where such is fitted, is not clogged. Refer to *Seawater Filter, Check and Cleaning*, page 65.
- Check the impeller in the sea water pump. Refer to *Impeller, Check and Change*, page 63.

If the alarm continues despite the above actions being carried out, run the engine at low revolutions and drive the boat to the nearest service workshop for repair.

Oil pressure

If the oil pressure lamp lights up during operations, the engine oil pressure is too low.



IMPORTANT:

Continued operations with too-low oil pressure causes serious engine damage.

- Checking Engine Oil Level, refer to *Oil level, checking and topping up*, page 53.
- Check that the oil filter is not blocked. Change the oil filter as necessary; refer to *Engine oil and oil filter, changing*, page 54.
- Contact a Volvo Penta workshop if the fault remains.

Battery

The charging lamp lights up when the alternator stops charging the batteries, which may result from a fault in the electrical system or the need to tension the alternator drive belt.



- Check belt tension. Refer to *Drive belt, check and change*, page 51.
- Check to see if there are no short circuit, chafed wires or wires with loose connections.
- Check the fluid level in the battery; refer to *Battery*, page 67.
- Contact a Volvo Penta workshop if the fault remains.

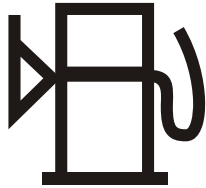


System failure

The "system fault" symbol is displayed when there is a short circuit or cable break.

The symbol shows if the ignition is left on, refer to *Engine Shutdown, page 37*.

- Check to see if there are any chafed wires or wires with loose connections.
- Contact a Volvo Penta workshop if the fault remains.



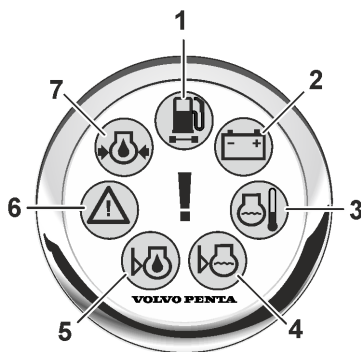
Fuel Level

The fuel level symbol is displayed when less than 20% fuel remains in the tank if a fuel level sensor is installed (optional equipment).

AUX

Auxiliary alarm

Alarm for auxiliary sensors (optional equipment).



P0004761

Alarm handling display (optional instrument)

- 1 The fuel level symbol lights up during operation when less than 20% fuel remains in the tank if a fuel level sensor is installed (optional equipment).
- 2 The battery lamp lights up if the alternator is not charging.
- 3 The coolant temperature lamp lights up when the coolant temperature is too high.
- 4 This indicator is not activated for the engine.
- 5 This indicator is not activated for the engine.
- 6 The "System Failure lamp" will light up at short circuit, broken wire and AUX failure.
- 7 If the oil pressure lamp lights up during operation, the oil pressure in the engine is too low.

Fault Tracing

A number of symptoms and possible causes of engine malfunctions are described in the table below. Always contact your Volvo Penta dealer if any problems occur which you cannot solve by yourself.

NOTICE! Read the safety regulations for care and maintenance in the *Safety precautions for maintenance and service operations* chapter before work you start work.

Symptoms and possible causes	
Start motor will not turn, or turns slowly	1, 2, 26
Engine does not start	3, 4, 5, 6, 7, 8, 27
Engine starts but stops again	5, 6, 7, 8
Engine is difficult to start	5, 6, 7, 8
Engine does not reach correct operating speed at full throttle	6, 7, 8, 9, 10, 11, 12, 17
Engine knocks	13
Engine runs roughly	5, 6, 7, 8, 12, 13
Engine vibrates	17, 18
High fuel consumption	9, 10, 12, 14, 17
Black exhaust smoke	4, 12, 14, 17
Blue or white exhaust smoke	14, 24
Lubrication oil pressure too low	15, 16
Coolant temperature too high	19, 20, 21, 22, 23
No charge, or poor charge	1, 25

1. Flat battery
2. Poor contact/open circuit in cables
3. The stop lever is pulled out
4. Insufficient preheat
5. Lack of fuel
6. Blocked air filter
7. Air in the fuel system
8. Water/contamination in fuel
9. Boat abnormally loaded
10. Fouling on hull, drive or propeller
11. Limited movement in engine control lever
12. Insufficient air supply to engine
13. Coolant temperature too high
14. Coolant temperature too low
15. Oil level too low
16. Blocked oil filter
17. Faulty / wrong propeller
18. Faulty engine mounting
19. Coolant level too low
20. Blocked raw water inlet, lines or filters
21. Circulation pump drive belt slipping
22. Faulty impeller
23. Faulty / wrong thermostat
24. Oil level too high
25. Alternator drive belt slipping
26. Time limit for cranking the starter motor
27. Stop solenoid has stuck

In Case of Emergency

Despite regular service in accordance with the planned maintenance schedule and perfect operating conditions, faults may occur that must be remedied before the boat can continue its trip. This chapter provides advice on how to remedy a number of conceivable faults.

If a fault occurs, confirm any fault alarm and take the necessary actions. See this chapter and refer to the *Fault handling, page 40* chapter.



P0002107

Starting Using Auxiliary Batteries

⚠ WARNING!

Explosion hazard. Batteries contain and give off an explosive gas which is highly flammable and explosive. A short circuit, open flame or spark could cause a violent explosion. Ventilate well.

⚠ WARNING!

Never confuse the positive and negative poles on the batteries. Risk of arcing and explosion.

- 1 Check that the auxiliary battery has the same voltage as the engine system voltage.
- 2 Connect the red positive cable to the plus (+) terminal on the discharged battery and then to the plus terminal on the auxiliary battery.
- 3 Connect the black start cable to the minus (-) terminal on the auxiliary battery and to a place a little distance away from the discharged battery, e.g. the start motor's negative terminal.

⚠ WARNING!

The black jumper cable (-) must never come in contact with the positive connection on the starter motor.

- 4 Start the engine and let it run at fast idle for approximately 10 minutes to charge the batteries. Make sure there is no extra equipment connected to the electrical system.

⚠ WARNING!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.

⚠ WARNING!

Do not touch the connections during the start attempt: Risk of arcing.

Do not bend over any of the batteries either.

- 5 Turn off the engine. Remove the start cables in the exact opposite order to their connection.

Maintenance Schedule

Your Volvo Penta engine and its equipment are designed for high reliability and long life. The engines are built to have the smallest possible environmental impact. To retain these qualities and to avoid unnecessary malfunction, preventive maintenance needs to be performed. It is the owner's responsibility to make sure that services are performed at intervals in the Service protocol, in order for the warranty to be valid.

The services content can be found in the Service Protocol, available for download at www.volvopenta.com.

NOTICE! For emission-related warranty rights, see *Emission Control System Warranty Statement*.

The service points that the operator/owner should be able to perform for safety reasons, if anything unforeseeable should occur when under way, are shown in the Operator's manual. Refer to chapter *Maintenance*, page 46.

The service points need to be carried out regular between the service intervals.

For products covered by the warranty, please refer to the terms and conditions of the warranty regarding documentation of completed services.

Maintenance

This chapter contains general technical information and instructions on how the common maintenance items that must be carried out. Read through the instructions carefully before starting work.

Read through the safety precautions for maintenance and service in the *Safety precautions for maintenance and service operations* chapter before work on the engine is begun.

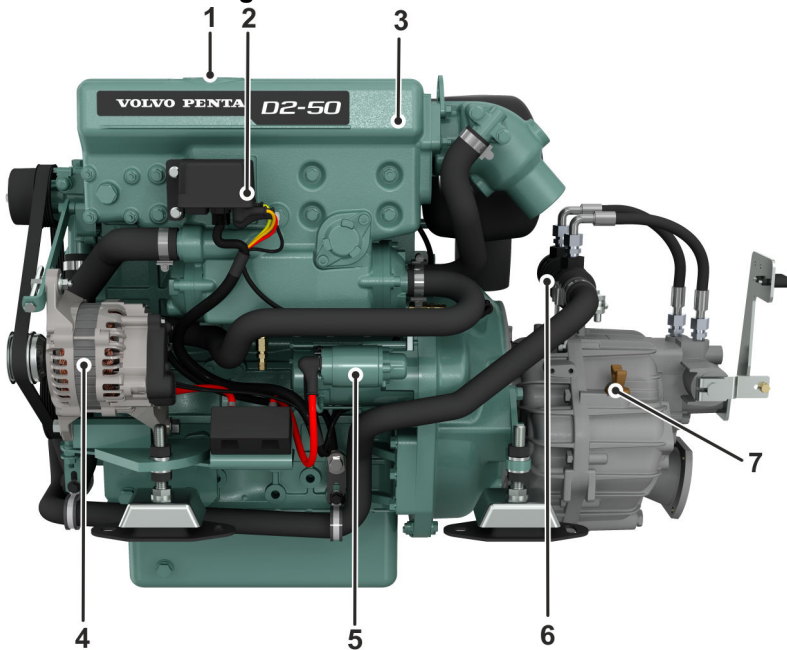
Volvo Penta recommend that all servicing with the engine running should be undertaken by an authorized Volvo Penta workshop. The intervals when maintenance items must be carried are indicated in the *Maintenance Schedule, page 45*.

⚠ WARNING!

Care and maintenance work should be done with the engine stopped unless otherwise specified. Stop the engine before opening or removing the engine hatch/hood. Make it impossible to start the engine by removing the start key and cutting the system voltage with the main switches.

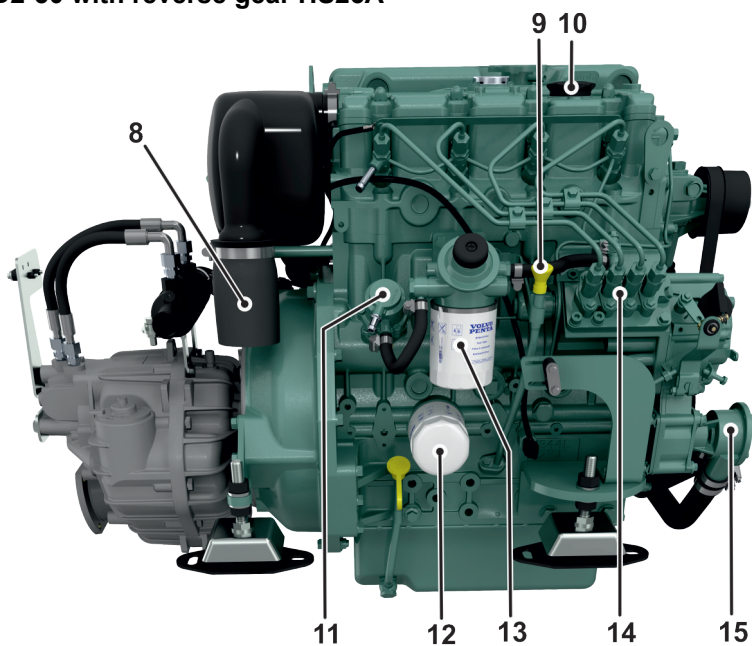
NOTICE! More information on how to perform service and maintenance can be found in the ***Service and Maintenance handbook***. The manual is available for download at www.volvopenta.com.

D2-50 with reverse gear HS25A



- 1 Coolant filling
- 2 Relay box
- 3 Heat exchanger
- 4 Alternator
- 5 Starter motor
- 6 Oil cooler, reverse gear
- 7 Oil dipstick, reverse gear

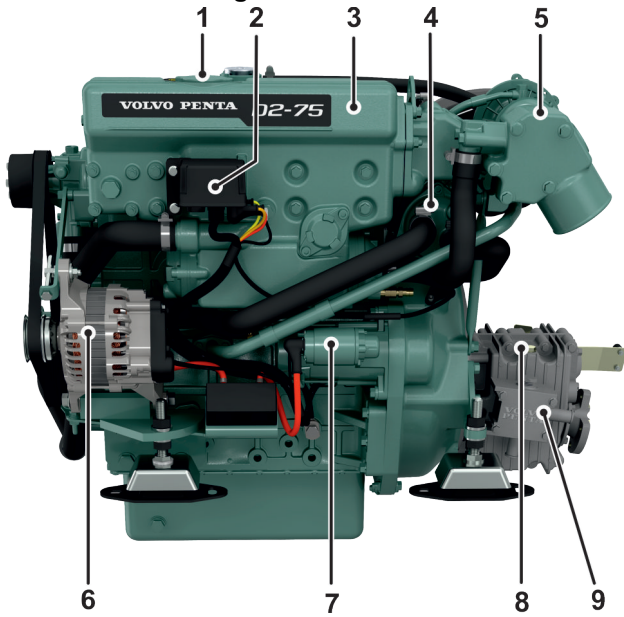
P0027188

D2-50 with reverse gear HS25A

- 8 Air filter/air intake
- 9 Oil dipstick, engine
- 10 Oil filler, engine
- 11 Fuel pump
- 12 Oil filter
- 13 Fuel filter
- 14 Injection pump
- 15 Raw water pump

P0022540

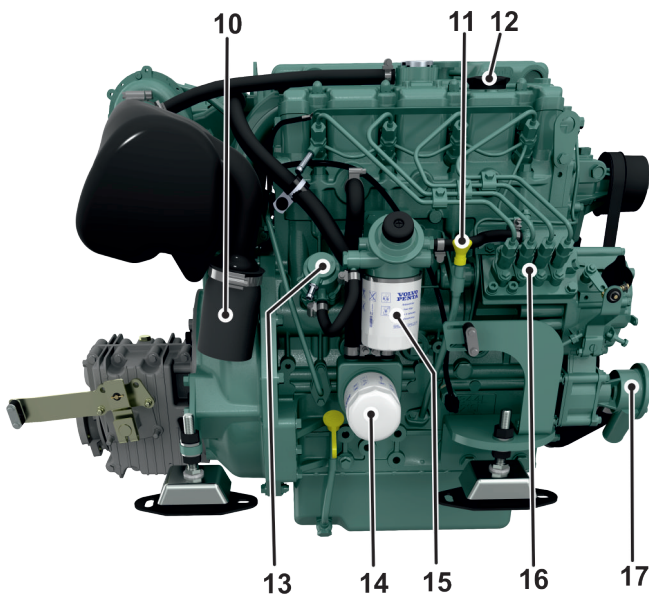
D2-60/75 with reverse gear MS25L



P0022541

- 1 Coolant filling
- 2 Relay box
- 3 Heat exchanger
- 4 Charge air cooler
- 5 Turbocharger
- 6 Alternator
- 7 Starter motor
- 8 Oil dipstick, reverse gear
- 9 Oil cooler, reverse gear

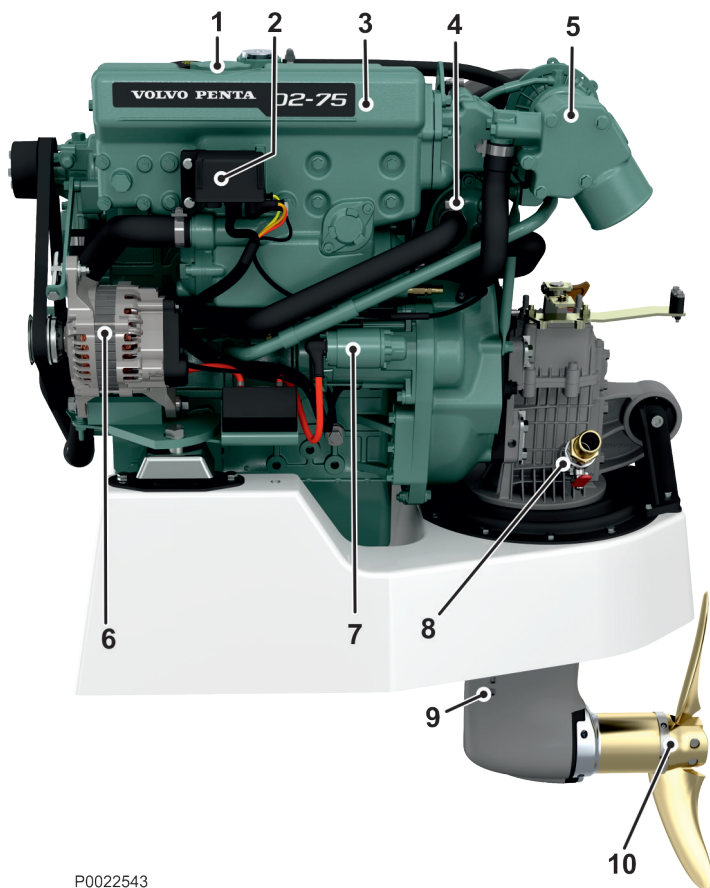
D2-60/75 with reverse gear MS25L



P0022542

- 10 Air filter/air intake
- 11 Oil dipstick, engine
- 12 Oil filler, engine
- 13 Fuel pump
- 14 Oil filter
- 15 Fuel filter
- 16 Injection pump
- 17 Raw water pump

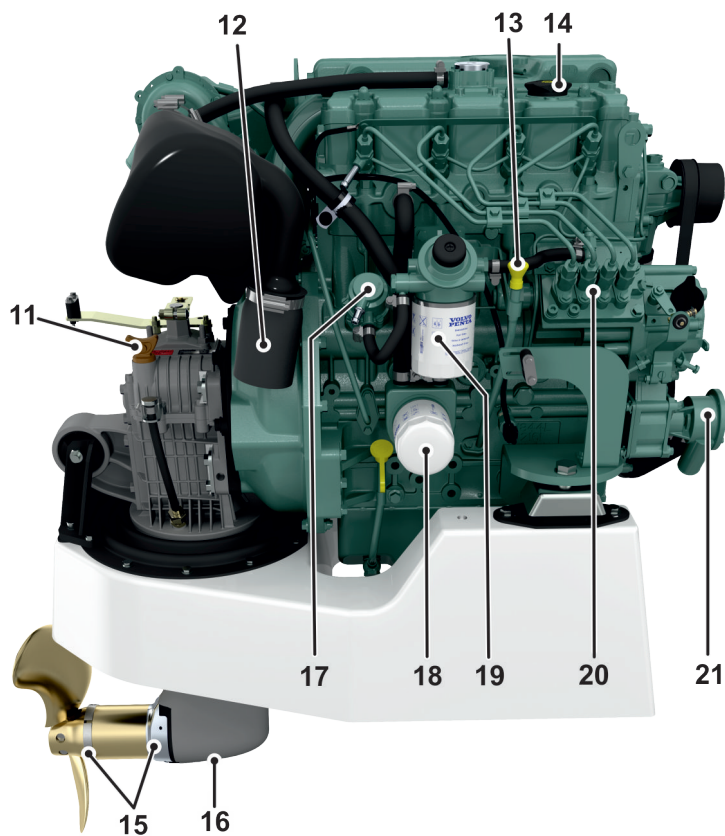
D2-60/75 with sail-drive 150S



P0022543

- 1 Coolant filling
- 2 Relay box
- 3 Heat exchanger
- 4 Charge air cooler
- 5 Turbocharger
- 6 Alternator
- 7 Starter motor
- 8 Sea cock, S-drive
- 9 Cooling water inlet, S-drive
- 10 Folding propeller

D2-60/75 with sail-drive 150S



P0022544

- 11 Oil dipstick, S-drive
- 12 Air filter/air intake
- 13 Oil dipstick, engine
- 14 Oil filler, engine
- 15 Sacrificial anodes
- 16 Oil drain, S-drive
- 17 Fuel pump
- 18 Oil filter
- 19 Fuel filter
- 20 Injection pump
- 21 Raw water pump

Engine, General

General inspection

Make a habit of visually checking the engine and engine bay before starting, and after operations when you have stopped the engine. This will help you to quickly discover abnormalities, or if something is about to happen.

Look especially carefully for oil, fuel and coolant leakages, loose bolts, worn or poorly-tensioned drive belts, loose cable connections, damaged electrical cables and hoses. This inspection only takes a few minutes and can prevent serious malfunctions and expensive repairs.

⚠ WARNING!

Risk of fire.

Remove all accumulations of fuel, oil and grease when detected on the engine or in the engine room.

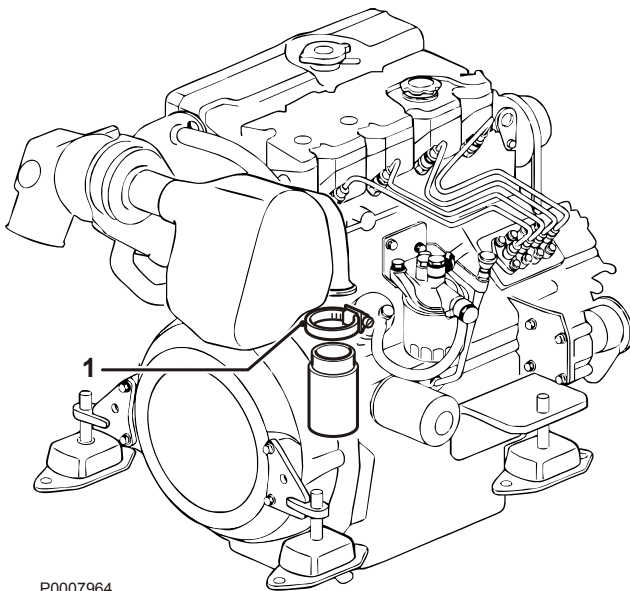
⚠ WARNING!

If an oil, fuel or coolant leak is detected, the cause must be investigated and the fault rectified before the engine is started.

Never direct the jet from a high-pressure washer at seals, rubber hoses or electrical components. Never use the high pressure setting for engine cleaning.

Air filter, cleaning

- 1 Remove the hose clamp (1) and remove the filter. Remove the spring located inside the filter. Make sure that contaminants do not enter the engine.
- 2 If necessary, clean the filter by washing it in soap solution. Then rinse it in clean water. Squeeze out the filter and allow it to dry.
- 3 Reinstall the filter and the hose clamp.



Drive belt, check and change

▲ WARNING!

Stop the engine before doing any maintenance work.

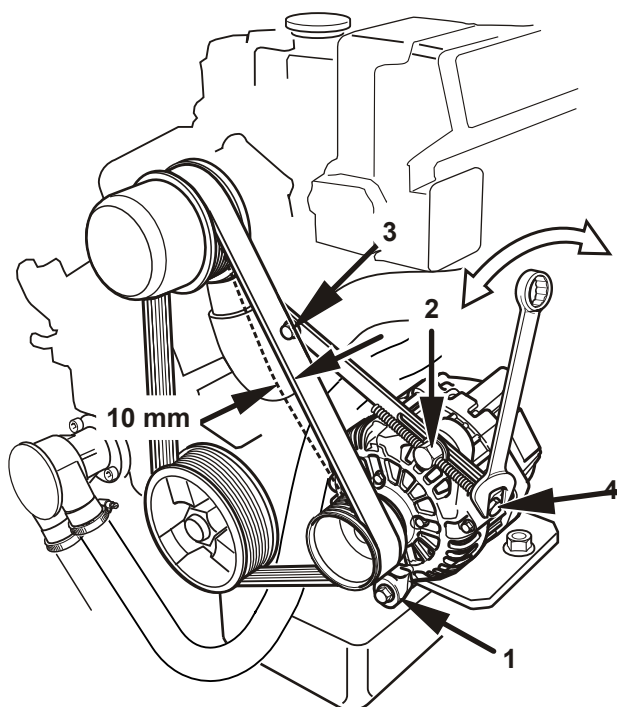
Check belt tensions and condition regularly. A belt that is tensioned too tightly may damage bearings, while a belt too-loosely tensioned may slip.

Check and adjust the belt after operation, while the belt is still warm.

A correctly-tensioned belt should be possible to depress approx. 10 mm (0.4") between the pulleys.

IMPORTANT:

Always replace a belt that appears worn or is cracked. Belts working in tandem must be replaced simultaneously.

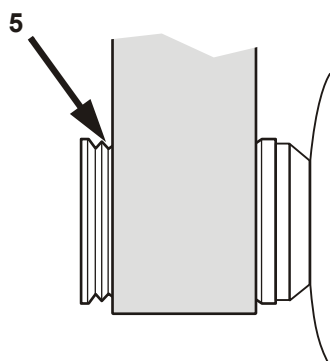


Adjusting the drive belt

- 1 Undo the alternator retaining bolts (1-3).
- 2 Using the adjuster screw (4), adjust the belt to the correct tension.
- 3 Tighten the bolts (1-3) and check the tension.

Replacing the drive belt

- 1 Undo the alternator retaining bolts (1 and 2).
- 2 Press the alternator toward the engine block so that the belt can be removed. Wipe clean the belt grooves.
- 3 Install the new belt. Adjust.
- 4 Check the belt tension again after a few hours' operations.



P0007963

Idling

For engine idle revolutions, refer to the *Engines* section. Low idle revolutions may cause the engine to stall, while higher idle revolutions cause extra stress on the drive/reverse gear during shifting maneuvers.

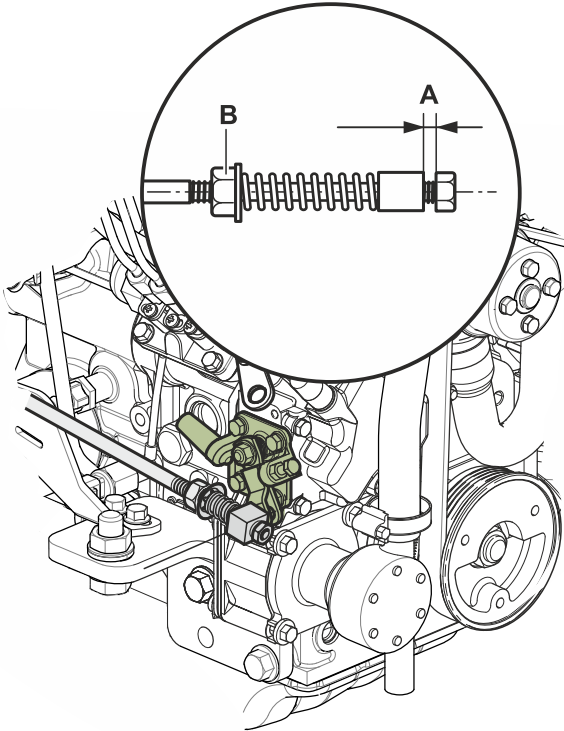
Adjustment must be made while the engine is warm.

- 1 Put the control lever in neutral.
Check that the gap (A) is around 3 mm.
Undo locknut (B) and adjust screw (C) to give the correct gap. Tighten the locknut.⁽¹⁾
- 2 Start the engine and let it idle with the control lever in the neutral position.

▲ WARNING!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.

- 3 Undo the locknut (D). Adjust to the correct revolutions using the adjuster screw (E). Tighten the lock nut.
- 4 Repeat item 1.



P0021659

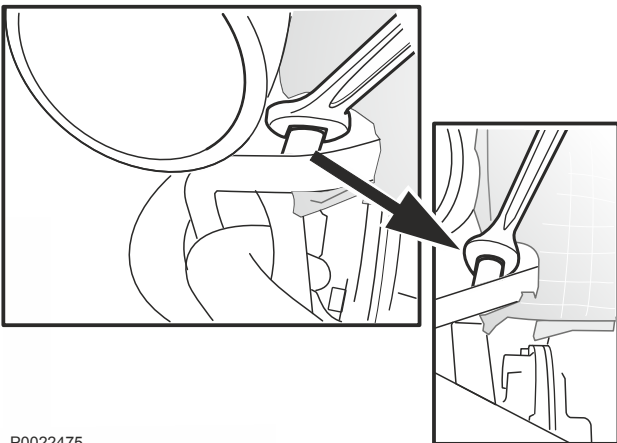
Wastegate Valve

After a longer break in operations there is a risk of the turbocharger wastegate sticking. Check that is possible to turn the shaft .

If the wastegate is stuck exercise the shaft gently with a spanner back and forth to secure ability to move as intended.

▲ CAUTION!

Limit rotation to 15 degrees from the closed position.



P0022475

1. This item does not apply to boats with twin helm stations.

Lubrication System

Oil change intervals can vary depending on oil quality, refer to *Technical Data*, page 82.

Oil change intervals must never exceed a period of 12 months.

If you want longer oil change intervals than stated in the table *Technical Data*, page 82, the oil change interval can under certain conditions be increased. To see if the engine complies, Volvo Penta oil analysis need to be performed. Contact your Volvo Penta dealer for further information.



P0002089

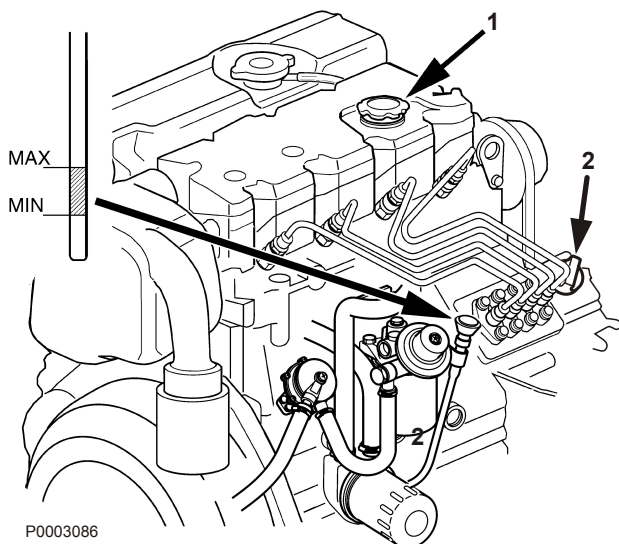
Oil level, checking and topping up

The oil level must be within the marked area on the oil dipstick and must be checked daily before the first start.

IMPORTANT:

Do not fill up above the maximum oil level. Only use a recommended viscosity and quality of oil.

- 1 Fill oil slowly through the oil filler on top of the engine (1) or at the side (2).
- 2 Wait 5 minutes so that the oil has time to run down into the engine.
- 3 Check the oil level again when the engine has cooled.



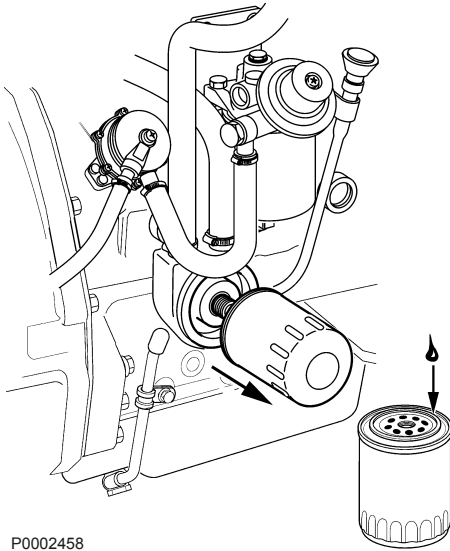
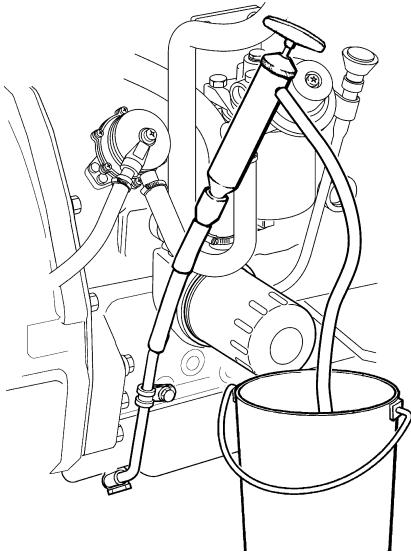
P0003086

Engine oil and oil filter, changing

Always follow the recommended oil change interval. Use only oils of the recommended grades; refer to *Oil Grade and Oil Change Interval*.

⚠ WARNING!

Hot oil and hot surfaces can cause burns.



P0002458

- 1 Run the engine until warm so that the oil is easier to pump. Stop the engine.
- 2 Connect an oil drain pump to the oil drain pipe. Pump out the oil.
- 3 Unscrew the lubricating oil filter. Place a plastic bag over the filter before it is unscrewed to avoid oil spillage.
- 4 Check that the filter contact area on the engine is clean.
- 5 Apply a film of oil on the new filter gasket. Screw the filter on by hand until it touches the contact surface. Then tighten an extra half turn, no more!
- 6 Fill with oil to the correct level through the oil filler on top or to the side of the engine. For oil quantity, refer to the *Technical Data, Lubrication System* section.
Start the engine. Run the engine until it reaches normal operating temperature. Check that the low oil pressure lamp goes out and that there are no leaks around the oil filter.
- 7 Turn off the engine. Wait ten minutes before checking the oil level. Top up as needed.

NOTICE!

Hand in the old oil and oil filter to a re-cycling station.

Fuel System

Only use the grades of fuel recommended in the fuel specification, see *Technical Data, page 83*. Always observe the greatest cleanliness during re-fuelling and work on the fuel system.

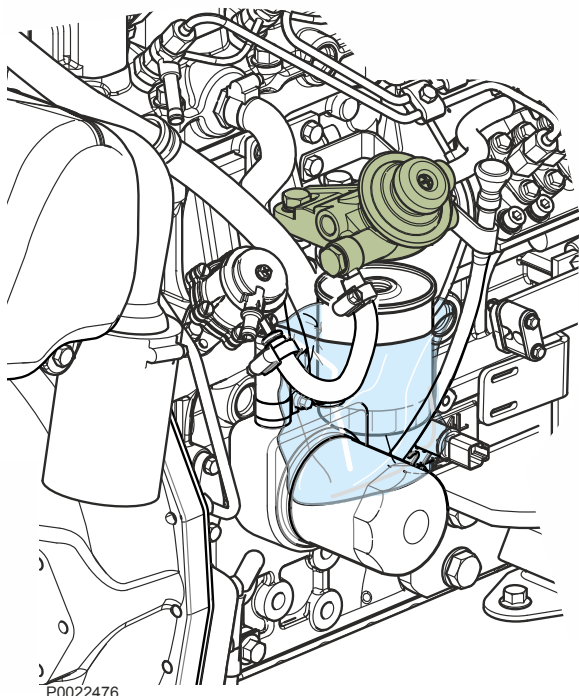
All work on the unit injectors of the engine must be carried out by an authorized workshop.

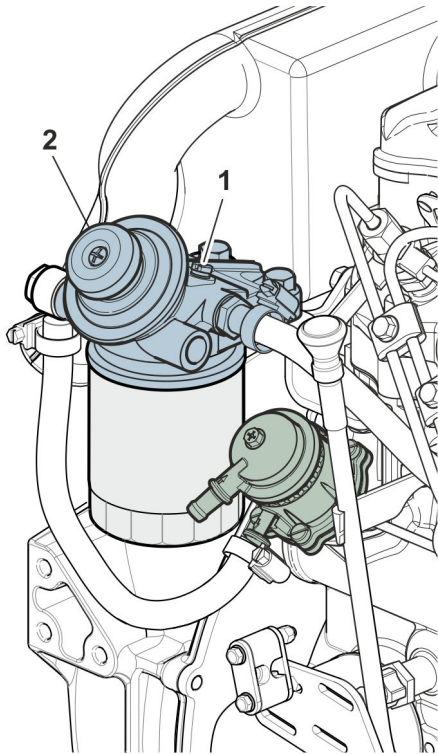
▲ WARNING!

Fire hazard. When carrying out work on the fuel system make sure the engine is cold. A fuel spill onto a hot surface or an electrical component can cause a fire. Store fuel soaked rags so that they cannot cause fire.

Engine Fuel Filter Replacement

- 1 Clean the filter bracket.
Avoid fuel spills by placing a plastic bag around the filter
- 2 Unscrew the filter
- 3 Apply a film of oil on the new filter gasket.
- 4 Screw the filter on by hand until it touches the contact surface. Then tighten an extra half turn, no more!
- 5 Purge the fuel system, refer to the *Fuel system, bleeding, page 56* section.
- 6 Start the engine and check for leaks.
- 7 Hand in the old filter to a re-cycling station.





P0026242

Fuel system, bleeding

The fuel system must be purged after a filter change, if the fuel tank has been run dry and after a long-term stoppage.

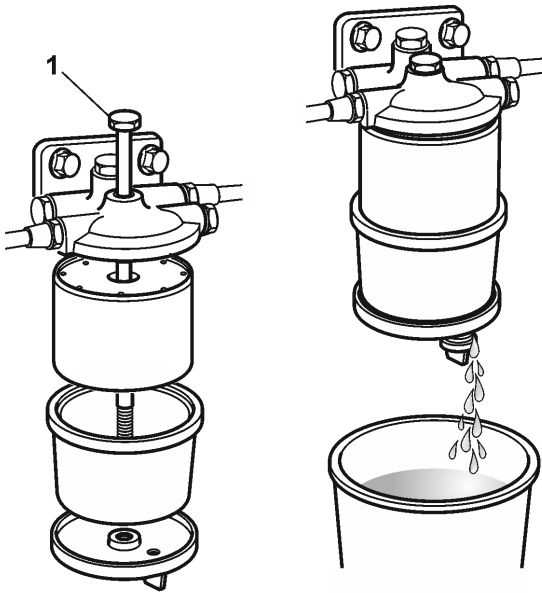
- 1 Open the purge screw (1) on the fuel filter console approx. three turns. Avoid fuel spills; use rags to soak up fuel at the purging point.
- 2 Pump fuel up with the hand pump (2) until fuel without air bubbles can be seen. Continue pumping and tighten the purging screw at the same time.
- 3 Start the engine and check for leaks.

Fuel pre-filter

The fuel pre-filter is an optional extra.

Draining

Wait a few hours after the engine has been turned off before draining the filter. Position a container under the fuel filter. Drain off water and contaminants using the cock/plug at the bottom of the filter bowl.



P0022397

Replacing filter insert

- 1 Close fuel cock at the fuel tank. Position a container under the fuel filter.
- 2 Remove the filter bowl by undoing screw (1).
- 3 Empty and clean the filter bowl. Replace insert and reinstall the bowl.
- 4 Open fuel cock.
- 5 Vent the fuel system, please refer to section *Fuel system, bleeding, page 56*.
- 6 Start the engine and check for leaks.
- 7 Deposit the old filter insert at a properly designated disposal site.



P0013077

Freshwater System

The cooling system ensures that the engine operates at the correct temperature. It is a closed system that should always be filled with a coolant mixture.

IMPORTANT:

Coolant of a suitable chemical composition must be used all year round to protect the engine against internal corrosion, cavitation and freeze bursting. This even applies when there is no risk for freeze damage, to make sure the engine always has a complete corrosion protection.

Therefore, the use of anti-corrosion agents alone, or water alone as a coolant, is not permitted in Volvo Penta engines.

The coolant must be based on Organic Acid Technology (OAT). Using an improper coolant or mixing with another coolant will rapidly reduce the performance and lifetime of the engine. Material incompatibility can lead to leakages, which - in the worst case - can cause engine breakdown.

Volvo Penta strongly recommend the use of our own coolants, "Volvo Penta Coolant VCS Ready Mixed" or the concentrate "Volvo Penta Coolant VCS", which ensure the protection of the cooling system components from corrosion, ageing, swelling and cracking, thereby ensuring optimal engine lifetime.

Over time the corrosion protection additives become less effective, and consequently the coolant must be changed at regular intervals to maintain sufficient protection of the engine. The latest Service Protocol that specifies service intervals can be found at volvopenta.com.

Coolant, Mixing

It is extremely important that the system is filled with the correct coolant concentration; refer to *Technical Data, page 84*.

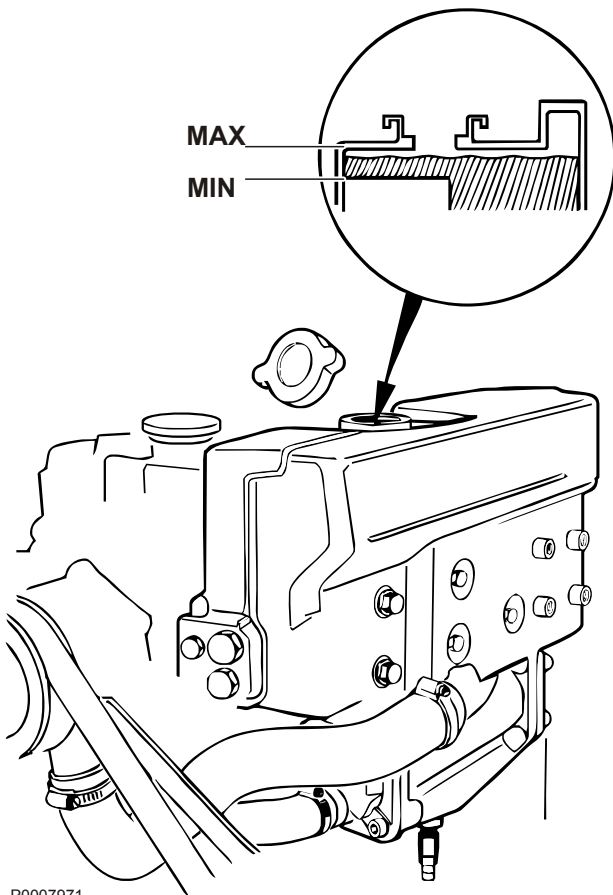
The coolant should be mixed with distilled, deionized water. For Volvo Penta specified water requirements; refer to *Technical Data, page 84*.

NOTICE! If water quality can not be guaranteed, use ready mixed coolant.

Coolant Level, Checking and Topping Up

⚠ WARNING!

Do not open the coolant filler cap when the engine is hot, except in emergencies, as this could cause serious personal injury. Steam or hot fluid could spray out.



P0007971

- 1 Turn the filler cap slowly counter-clockwise and release any pressure from the system before removing the cap completely.
- 2 Top up with coolant as necessary. The coolant level must be between the filler opening and the lower edge of the level marker.
If a separate expansion tank is installed (optional equipment), the coolant level must be between the MAX and MIN marks on the auxiliary expansion tank.
- 3 Screw on the filler cap.

When filling a completely empty system the coolant level must be checked after the engine has been run for an hour or so, as the system is self purging. Top up with coolant as necessary.

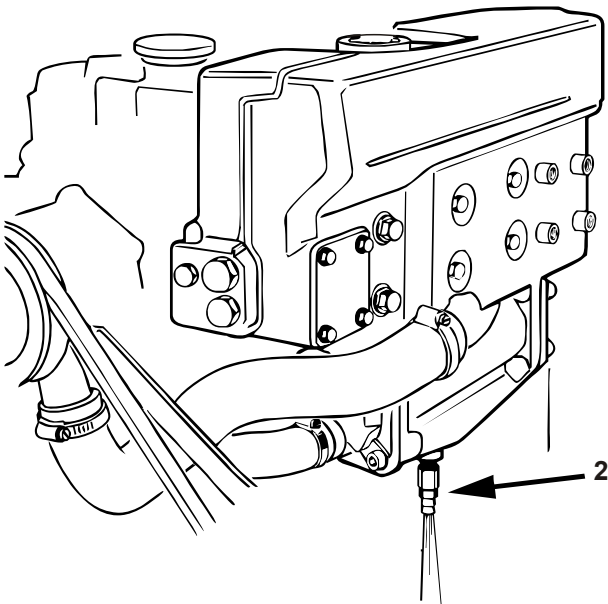
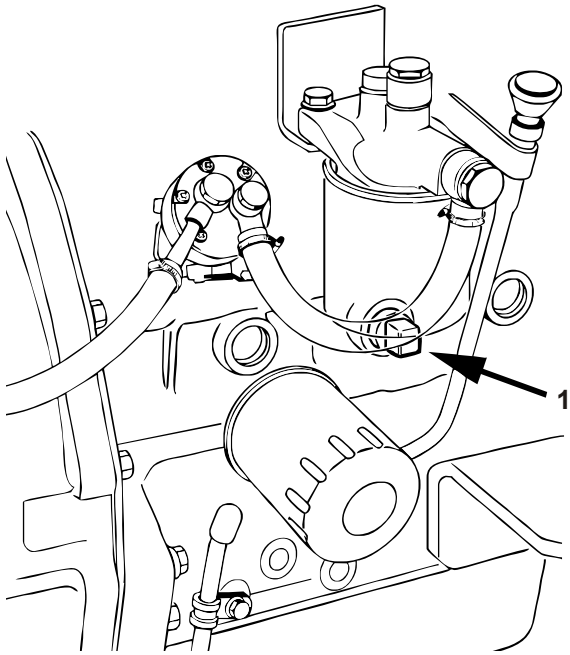
Coolant, Draining

▲ WARNING!

All coolant is hazardous and harmful to the environment. Do not consume. Coolant is flammable.

- 1 Place a collection vessel beneath the engine block drain plug (1) and at the heat exchanger drain tap (2).
- 2 Remove the filler cap on the expansion tank to speed up coolant drainage.
- 3 Open the drain plug (1) and the drain tap (2). Allow all the coolant to run out.
- 4 Collect the old coolant and hand it to a recycling station

The heat exchanger must be cleaned before new coolant is added.



P0007972

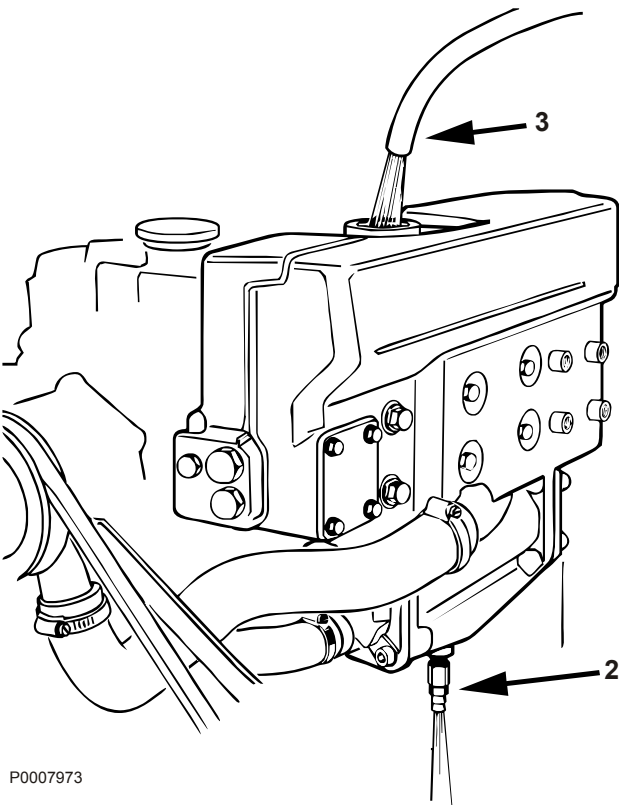
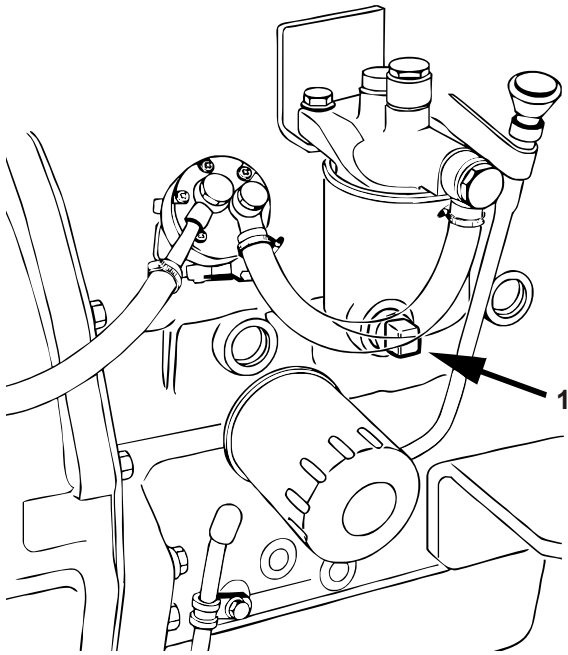
Heat exchanger, cleaning

⚠ WARNING!

All coolant is hazardous and harmful to the environment. Do not consume. Coolant is flammable.

Cooling performance is reduced by scaling in the heat exchanger. It should therefore be flushed when the coolant is changed.

- 1 Drain the coolant, please refer to section *Coolant, Draining*, page 59.
- 2 Insert a hose into the filling pipe (3) on the heat exchanger. Rinse with fresh water until the water which runs out of the drain tap (1) and the engine block (2) is clean. Let all the water run out.
- 3 Close the draining points (1 and 2). Fill up with coolant to the correct level. Put the filler cap back.



P0007973

Seawater System

The raw water system is the engine's external cooling system. On engines with drives, the raw water pump sucks in water via the drive, through the control system's oil cooler to the raw water pump. The water then passes through the raw water filter before being pumped through the fuel cooler, intercooler, engine oil cooler and heat exchanger. Finally the water is fed out through the exhaust elbow, where it is mixed with the exhaust gases.

On engines with reverse gears, the raw water pump sucks in water via a raw water intake, after which the water passes a raw water filter (extra equipment) before being pumped through the intercooler, heat exchanger, engine oil cooler and gearbox oil cooler. Finally the water is fed out through the exhaust elbow, where it is mixed with the exhaust gases.

WARNING!

Risk of water entry. Water will flow into the boat if any hose, plug etc. located below the waterline is removed when the boat is in the water. Always close the sea cocks. If the boat does not have sea cocks the water flow must be blocked in a safe manner. If this is not possible, the boat must be drawn up on land before work starts.

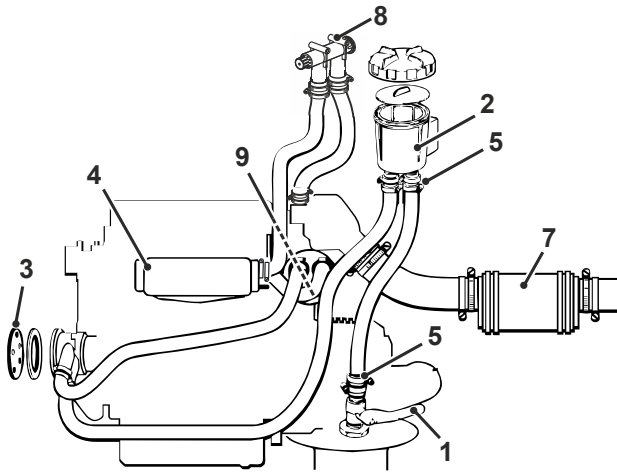
Seawater System, Draining

▲ WARNING!

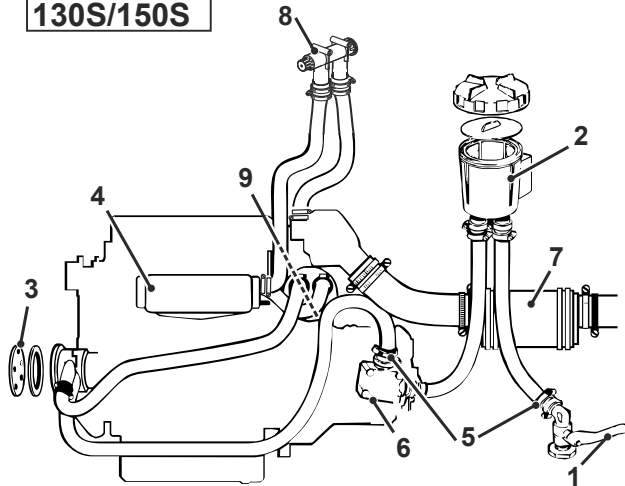
Risk of water entry. Close the seawater cocks before doing any work on the seawater system.

To prevent freeze bursting, the raw water system must be drained during cold weather when there is a risk of freezing. An alternative to draining is to keep the engine bay warm using an approved heater fan.

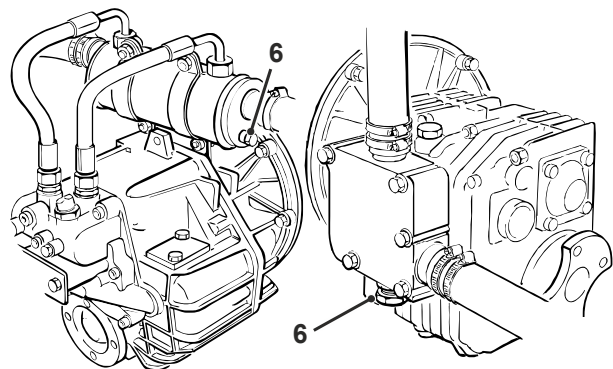
Note that all raw water must be drained and that the draining process must be adapted to suit the engine installation and any auxiliary equipment connected to it, such as a raw water filter (2), vacuum valve (8), exhaust riser and drain tap (9) and silencer (7) etc.



130S/150S



MS25/HS15

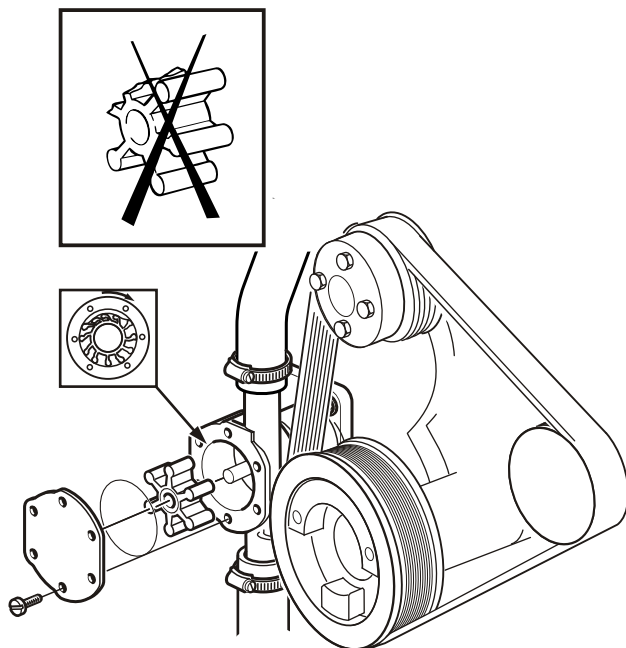


HS25

MS25

P0022499

- 1 Close the sea cock (1).
- 2 Remove the cover and the sealing plate on the raw water filter (2).
- 3 Remove the cover (3) from the raw water pump and let the water run out.
- 4 Open the drain tap (4) on the heat exchanger side panel and drain off the water.
D2-75: Open the drain tap (10) on the charge air cooler and drain off the water.
- 5 Loosen the hoses at the arrows (5) and empty them of water.
- 6 Connect a hose to the drain tap on the riser (9) and lead it into a container. Open the tap and drain off the water. Close the tap.
- 7 Remove the hose (6) on the reverse gear oil cooler and drain off the water.
- 8 Drain the silencer (7), the exhaust system and other auxiliary equipment connected to the raw water and exhaust systems.
- 9 Reinstall all hoses, the raw water pump cover and the raw water filter cover and sealing plate. Close the heat exchanger drain tap.
D2-75: Close the charge air cooler drain tap.
- 10 Open the raw water tap when the boat is returned to operations.
Check that no leakage exists in the raw water system.



P0007527

Impeller, Check and Change

▲ WARNING!

Risk of water entry. Close the seawater cocks before doing any work on the seawater system.

- 1 Close the sea cock.
- 2 Remove cover on the seawater pump. Remove impeller .
If there are cracks or other defects the impeller must be replaced.
- 3 Lubri-cate the pump housing and the inside of the cover with a little glycerin.

IMPORTANT:

The impeller will get damaged if other types of lubricant than glycerin are used.

- 4 Reinstall the impeller using a clockwise rotating movement.
- 5 Install the cover together with a new gasket. Open the sea cock.

Always carry a spare impeller on board.

Seawater System, Cleaning and Inhibiting

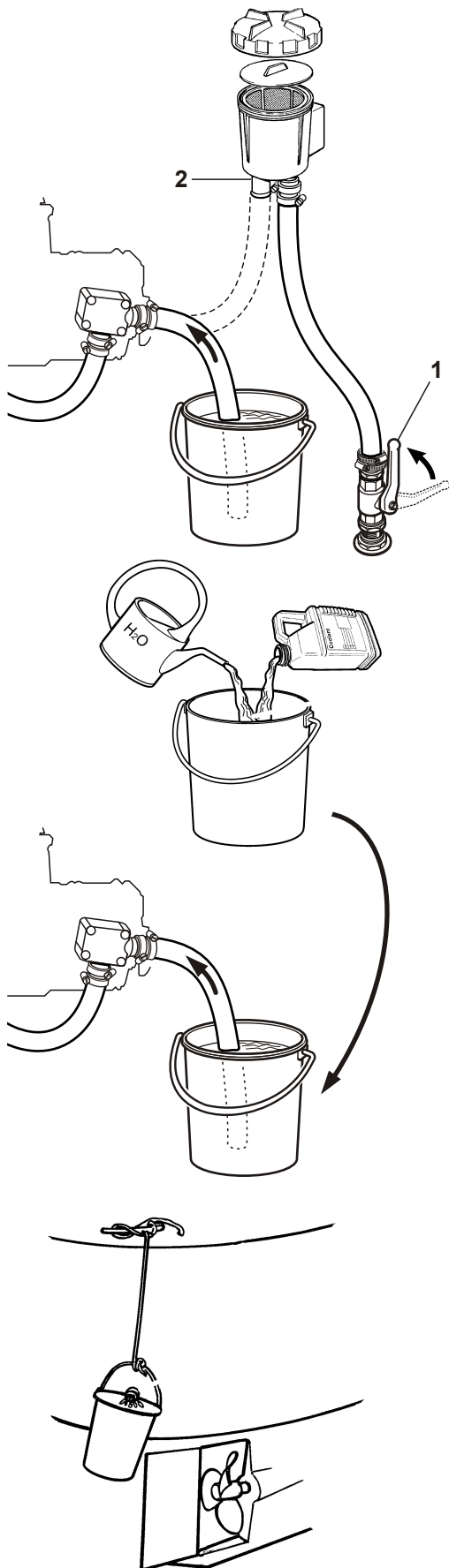
The raw water system must be flushed with fresh water, to prevent deposits and salt crystals from building up inside it. The system must also be conserved when the boat is laid up for winter or out-of-season storage so that it is protected from internal corrosion.

⚠ WARNING!

Risk of water entry.
Carry out cleaning and inhibiting the seawater system the boat on land.

⚠ WARNING!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.



- 1 Open the sea cock (1).
- 2 Remove the hose from the sea cock (1) or from the outlet side of the raw water filter (2) if such is fitted to the engine.
- 3 Put the free end of the hose into a bucket of freshwater. Proceed with refilling.
IMPORTANT!
The impeller will be damaged if it is run dry.
- 4 Check that there is no one in the vicinity of the propeller and that nothing risks being spattered by the exhaust outlet.
- 5 Set the control lever to neutral and start the engine. Let it run at fast idle for a few minutes. Stop the engine.
- 6 Fill the bucket with an antifreeze solution (40% Volvo Penta Coolant and 60% freshwater) and arrange for the collection of the solution throughout.
- 7 Start the engine and let it idle. Stop the engine just before the mixture is depleted. Repeat until the entire system has been flushed with the mixture.
- 8 Reconnect the removed hose.
- 9 The system is now conserved. The glycol mixture should remain in the system during storage. Before launching the boat, drain the mixture and hand it to a re-cycling station.

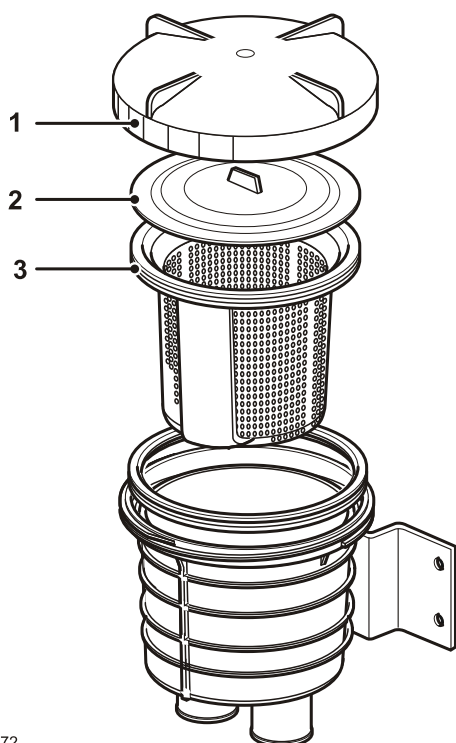
P0007530

Seawater Filter, Check and Cleaning

▲ WARNING!

Risk of water entry. Close the seawater cocks before doing any work on the seawater system.

If the water where the boat is used contains contaminants, seaweed, etc. the filter should be checked more frequently than stated in the maintenance schedule. Otherwise there is a risk that the filter may be blocked resulting engine overheating.



P0002472

- 1 Close the sea cock.
- 2 Unscrew the cover (1) and remove the sealing plate (2).
- 3 Lift out the insert (3) and clean it.
- 4 Replace parts as illustrated.
- 5 Open the sea cock and check for leaks.

Vacuum Valve

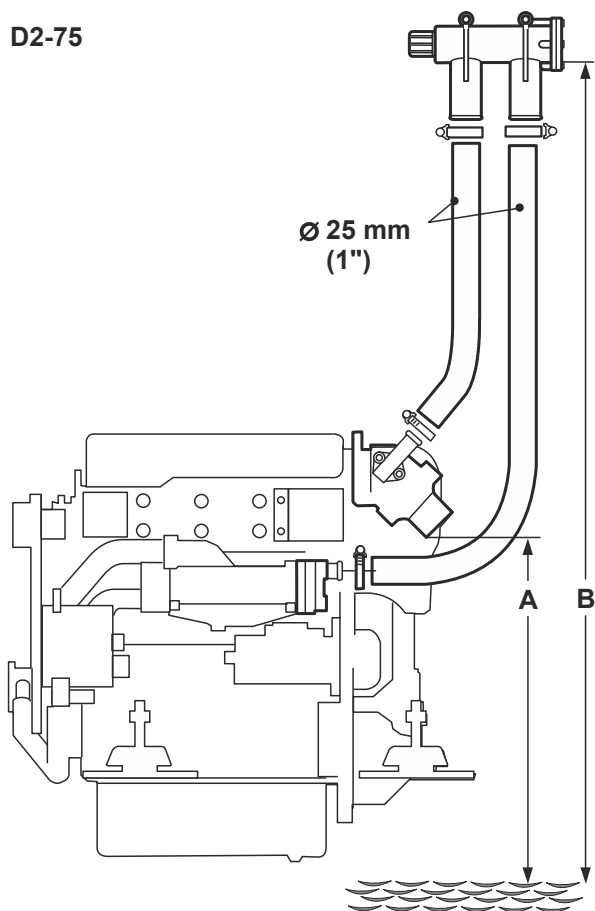
Certain configurations have a vacuum valve installed in the raw water system.

▲ WARNING!

Risk of water entry. Close the seawater cocks before doing any work on the seawater system.

- 1 Close the sea cock.
- 2 Remove the valve.
- 3 Clean all components.
- 4 Install the valve.

D2-75



P0022071

Electrical System

The engine is equipped with a 2-pole electrical system and an alternator. System voltage is 12V.

⚠ WARNING!

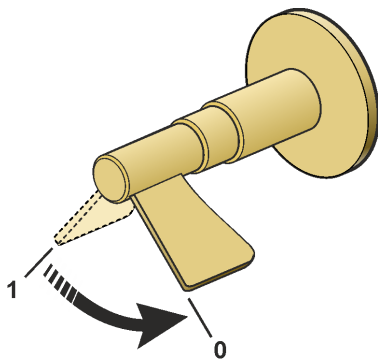
Always stop the engine and break the current using the main switches before working on the electrical system. Isolate shore current to the engine block heater, battery charger or accessories mounted on the engine.

Main switch

IMPORTANT:

Never disconnect the current using the main switches when the engine is running or by disconnecting the battery cables. The alternator and electronics could be damaged.

The main switches must never be switched off before the engine has stopped. If the circuit between the alternator and the battery is disconnected when the engine is running, the alternator and electronics can be damaged. For the same reason the charging circuits must never be re-connected with the engine running.



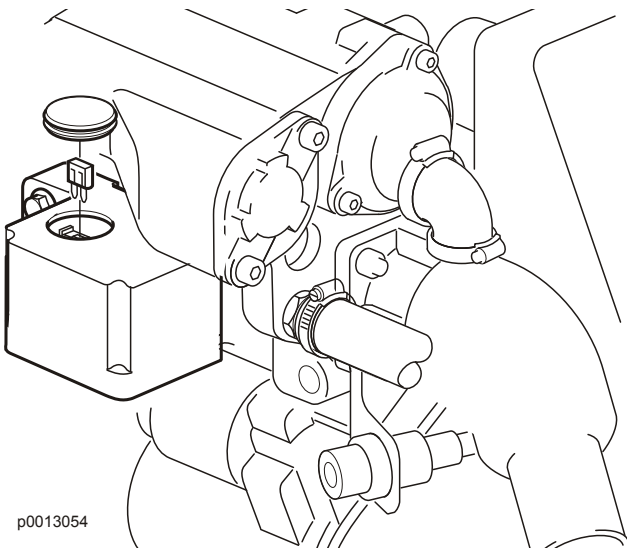
P0002576

Fuses

The engine is equipped with a strip fuse. The fuse cuts the power if the electrical system becomes overloaded. If it is not possible to start the engine or if the gauges stop working during operations the fuse may have deployed.

IMPORTANT:

Always investigate the cause of the overload. If the fuse trips frequently, contact an authorized Volvo Penta workshop.



p0013054

Electrical Connections

Check that electrical connections are dry, free from oxide, and that they are securely tightened.



P0002107

Battery

⚠ WARNING!

Risk of fire and explosion. Never allow an open flame or electric sparks near the batteries.

⚠ WARNING!

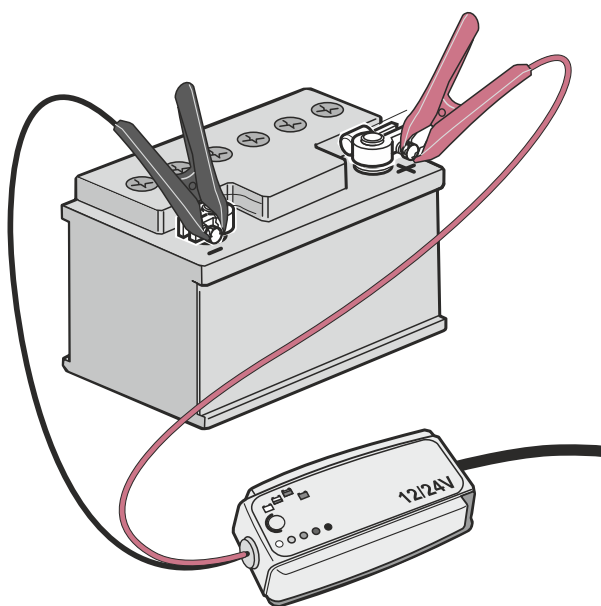
Battery electrolyte is a corrosive acid and should be handled with care. If you spill or splash electrolyte on any part of the body, immediately flush the exposed area with liberal amounts of water and seek medical attention as soon as possible.

⚠ WARNING!

Ventilate the engine compartment before working on batteries or battery connections.

IMPORTANT:

Batteries can be damaged if they are left discharged, and can also freeze and burst easier in cold weather. If the engine is not going to be used for a longer period of time, the batteries should be fully charged, trickle charged if possible.



P0022892

Maintenance

It is important to always follow the battery manufacturer's recommendation and instruction when replacing and charging batteries. Depending on battery type, the instructions for maintenance and charging may vary.

Modern batteries are normally maintenance free, but there are some actions that are recommended to increase the battery service life and avoid accidents:

- Keep the batteries clean and dry. Contamination and oxide on the batteries and battery poles can result in stray currents, voltage drop and discharge, especially in wet weather.
- Remove oxidation from the battery poles and terminals, using a brass brush.
- Tighten the terminals securely and grease them with terminal grease or petroleum jelly. Loose battery connections may cause damage to the engine's electrical system.
- Charge the battery regularly. A battery that is kept fully loaded has a maximum service life. The easiest way to check if a battery needs charging is to use a voltmeter.

NOTICE! If low starter battery alarm occur, the battery may get drained which might result in loss of functions and engine stopping.

Replacing Battery

IMPORTANT:

Make sure that the new battery fulfills the specifications in *Technical Data*. Read the information supplied with the battery before you begin the installation.

IMPORTANT:

Do not disconnect the batteries with the engine running. Sensitive electrical components can be immediately damaged.

⚠ WARNING!

Never confuse the positive and negative poles on the batteries. Risk of arcing and explosion.

Disconnecting (A)

- 1 Untighten the nut and remove the – cable (black).
- 2 Untighten the nut and remove the + cable (red).

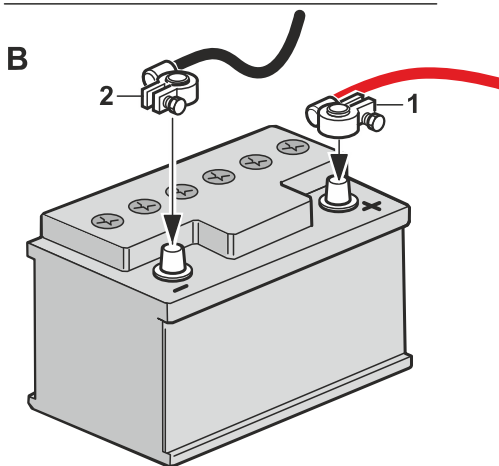
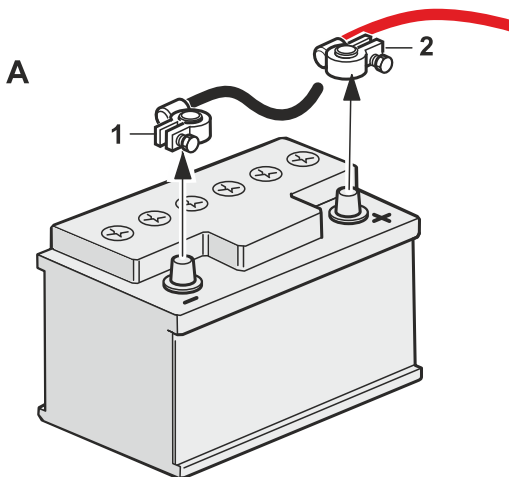
Remove the battery.

Connecting (B)

Place the new battery.

- 1 Connect the + cable (red) to the + pole on the battery and tighten the nut.
- 2 Connect the – cable (black) to the – pole on the battery and tighten the nut.

NOTICE! Hand in the old battery to a re-cycling station.



P0022893

Electrical Installations

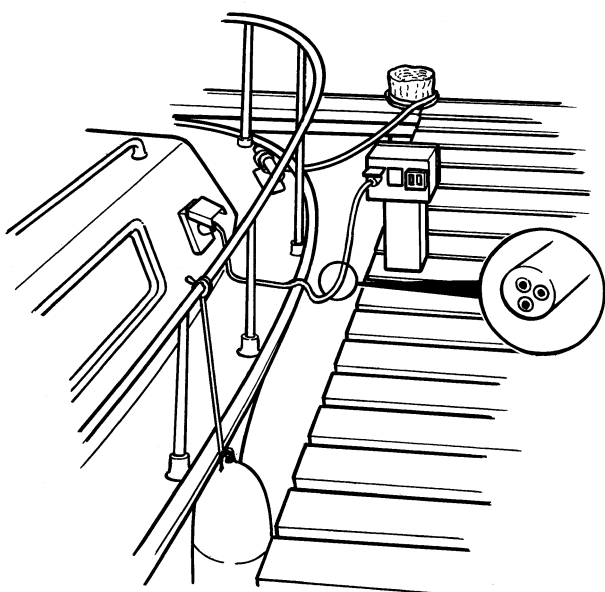
An incorrectly-carried-out electrical installation may generate leakage current from the electrical system. Leakage current can in turn render galvanic protection inadequate in respect of propellers, propeller shafts, rudder posts, the keel etc., and may cause damage through electrochemical corrosion.

▲ WARNING!

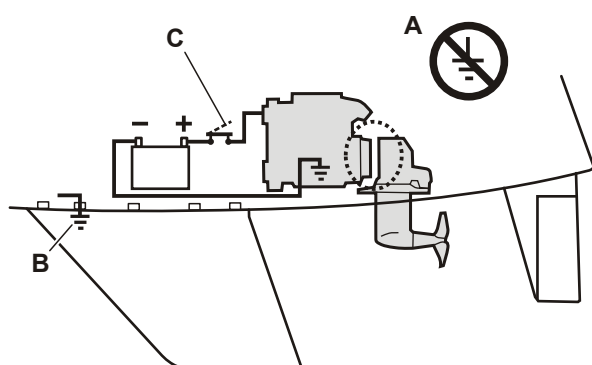
Work on the low voltage circuits in the boats should be done by a person with electrical training or knowledge. Installation or work on land current equipment must only be done by a competent electrician, in accordance with local regulations for mains electricity.

The following must always be heeded:

- 1 If shore power is connected it must always be ground protected ashore, never in the boat. Furthermore, the shore power installation should be equipped with a ground fault interrupter. The shore power installation (transformer, inverter, battery charger etc.) must be designed for marine use where the high-tension side is galvanically separated from the low-tension side.
- 2 Electrical cables must be run and clamped such that there is no risk of exposure to chafing, damp or bilge water.



P0003051



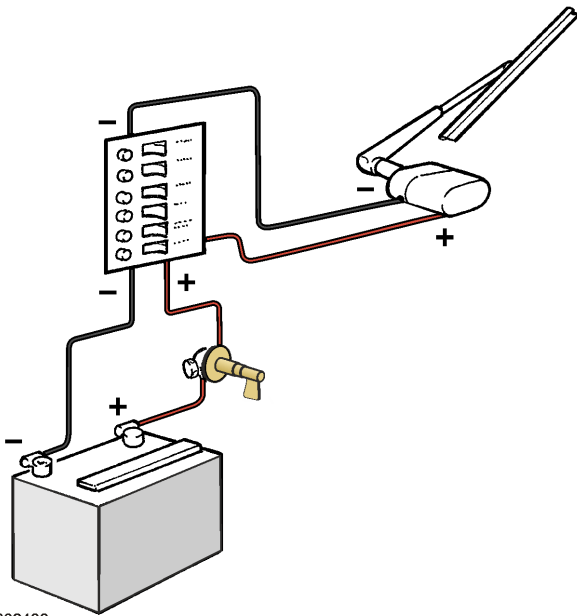
P0007534

- 3 Ground protection for radios, navigation instruments, rudder, boarding ladders or other equipment where separate cables for ground protection are present, must be clustered to a common ground connection (B) that is not connected to the engine or transmission.

IMPORTANT:

Never use the engine or transmission as earth planes.

The S-drive is insulated electrically (A) from the engine and may never be used as the ground or be connected electrically to other equipment such as radios, navigation equipment, rudder, and boarding ladders.



P0002486

- 4 The start battery must have a main switch (C) connected to the battery's plus (+) side. The main switch must break the circuit to all equipment and be switched off when the boat is not in use.
- 5 If an auxiliary battery is used, a main switch (1) must be placed between the auxiliary battery's plus (+) terminal and the circuit breaker panel for the boat's electrical equipment. The main switch must break the circuit to all equipment connected to the auxiliary battery and must be switched off when power is no longer required. All equipment connected to the auxiliary battery must have separate main switches.

For simultaneous charging of two independent battery circuits a separate charging distributor (accessory) should be installed on the standard alternator.

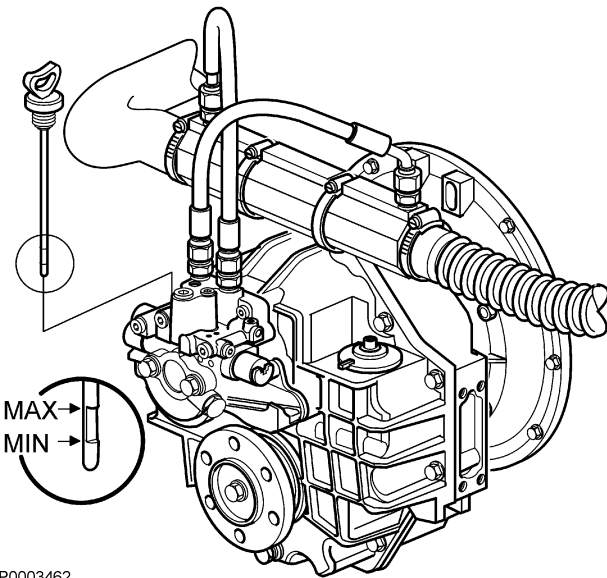
Reverse Gear

Oil level, checking and topping up

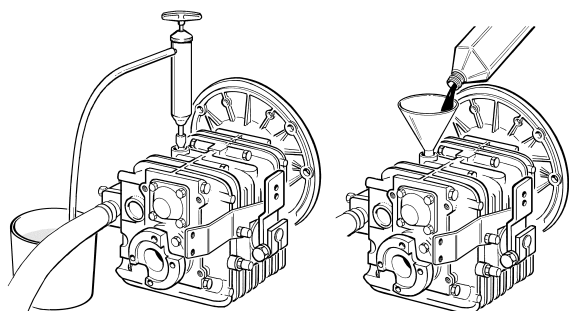
- 1 Start the engine and let it run on idle a few minutes.
- 2 Remove the dipstick by turning counter-clockwise.
- 3 Wipe the dipstick and reinsert it in the reverse gear without screwing it in. Remove the dipstick and check the oil level. The correct oil level is between the MAX and MIN markings.
- 4 Top up the oil as required using the dip stick tube. Please refer to section *Technical Data*, page 86 for oil quality and capacity.

IMPORTANT:

Never over-fill the reverse gear. The oil level must always be within the recommended range.



P0003462



P0007536

Reverse Gear, Oil Change

- 1 Pull out the oil dipstick.
- 2 Pump out the oil with the oil drain pump through the oil dipstick hole.
- 3 Measure out the correct quantity of oil and fill through the oil dipstick hole. For oil grade and quantity, refer to the *Technical Data, page 86* section.
- 4 Put the oil dipstick back in place.

IMPORTANT!

Never over-fill the reverse gear. The oil level must always be within the recommended range.

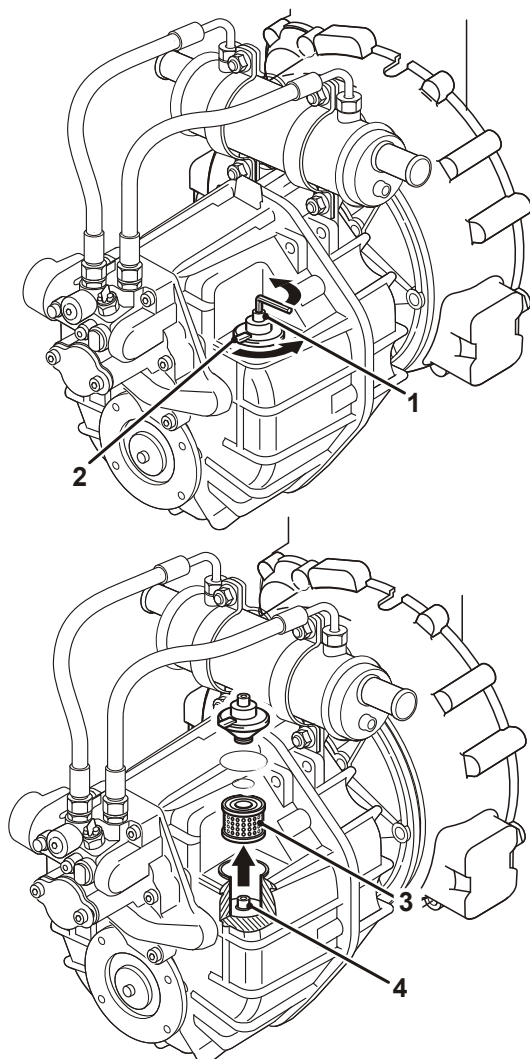
Oil and filterchange, HS25

- 1 Clean around the lid (2) so that there is no risk that dirt could fall down into the filter housing.
- 2 Undo screw (1) with a 6 mm Allen key. Remove lid (2). Replace and oil in the new O-rings in the lid.
- 3 Lift up the filter (3).
- 4 Suck up the oil with an oil drain pump, via the oil filter housing. Connect hose to the suction pipe (4) at the bottom of the housing.
- 5 Measure up the correct quantity of oil and fill the reverse gear with the oil via the oil filter housing. Please refer to *Technical Data, page 86* for oil grades and volume.

IMPORTANT:

Never over-fill the reverse gear. The oil level must always be within the recommended range.

- 6 Install the new filter (3) in the filter housing.
- 7 Install the lid. Tightening torque 5-8 Nm.
- 8 Put the control lever in neutral. Start and run the engine at 1500 rpm for a few minutes to ensure that the reverse gear oil cooler is filled with oil..
- 9 Stop the engine and check the oil level. Top up as necessary.

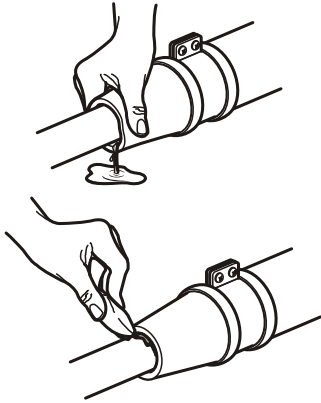


P0003080

Propeller Shaft Sealing, Check

If the boat is fitted with a Volvo Penta propeller shaft, the propeller shaft seals must be lubricated before launch and purged directly after launching.

Purge the glands by pressing them together, at the same time as they are pressed down onto the shaft. The press approximately 1 cm³ of water resistant grease into the seal.



P0002609

Drive

The S-Drive is equipped with a sacrificial anode that prevents galvanic corrosion. The galvanic protection can be disabled by incorrect electrical installations and suchlike. Damage caused by so-called electrolytic corrosion can appear quickly and can often be extensive. Read more about this in the *Electrical Installations, page 69* section.

Incorrectly performed stern drive painting or the wrong type of hull paint may render the galvanic protection ineffective. Read more about painting in the *Storage, page 80* section.

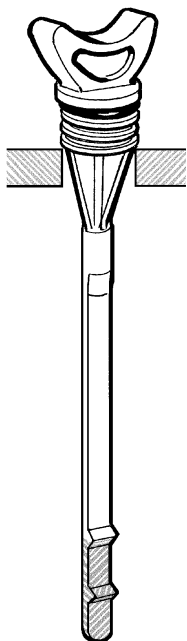
Transmission lubricant, checking and topping up

Remove the oil dipstick by unscrewing it counter-clockwise. Wipe the oil dipstick dry and replace it into the drive/reverse gear, without screwing it down. Pull out the oil dipstick again and check the oil level. The correct oil level is between the MAX and MIN marks.

If required, top up oil through the oil dipstick hole. For oil grade and quantity, refer to the *Technical Data, page 86* section

IMPORTANT:

Never over-fill the drive. The oil level must always be within the recommended range.



P0003758

Corrosion protection, checking and changing

Check the sacrificial anode (1) on the stern drive and the three sacrificial anodes (2) on the propeller regularly. Replace with new anodes when approximately 1/3 of an anode has corroded away.

When the boat is stored ashore, corrosion protection deteriorates due to oxidization of sacrificial anodes in contact with air. Even new anodes may have surface oxidation. Before launching the sacrificial anodes must be cleaned with emery cloth.

IMPORTANT:

Use emery paper. Do not use a wire brush or other steel tools when cleaning, as these may damage the galvanic protection.

- Zinc in salt water.
- Magnesium in freshwater.
- Aluminum when the boat is used primarily in salt water and sometimes in brackish water

Remedy any damaged stern drive paintwork according to the instructions in the *Storage, page 80* section.

Replacing sacrificial anodes

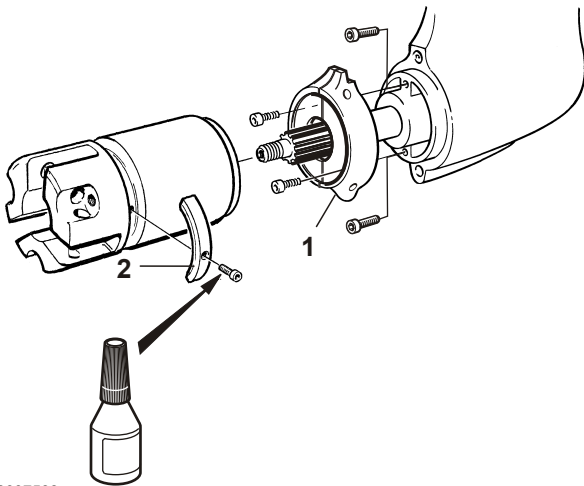
- 1 Remove the sacrificial anodes and thoroughly scrape clean the contact surfaces on the drive and propellers.
- 2 Apply thread locking fluid to the bolts to the propeller sacrificial anodes.
- 3 Install the new sacrificial anodes and fasten them to ensure good metallic contact.

Rubber Bellow

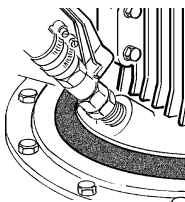
Check the rubber seal between the drive and the hull regularly for cracks and wear.

IMPORTANT:

The seal must be changed every seven years or earlier if it is defective. This work should be carried out by an authorized workshop.



P0007538



P0003085

Propeller

Folding Propeller

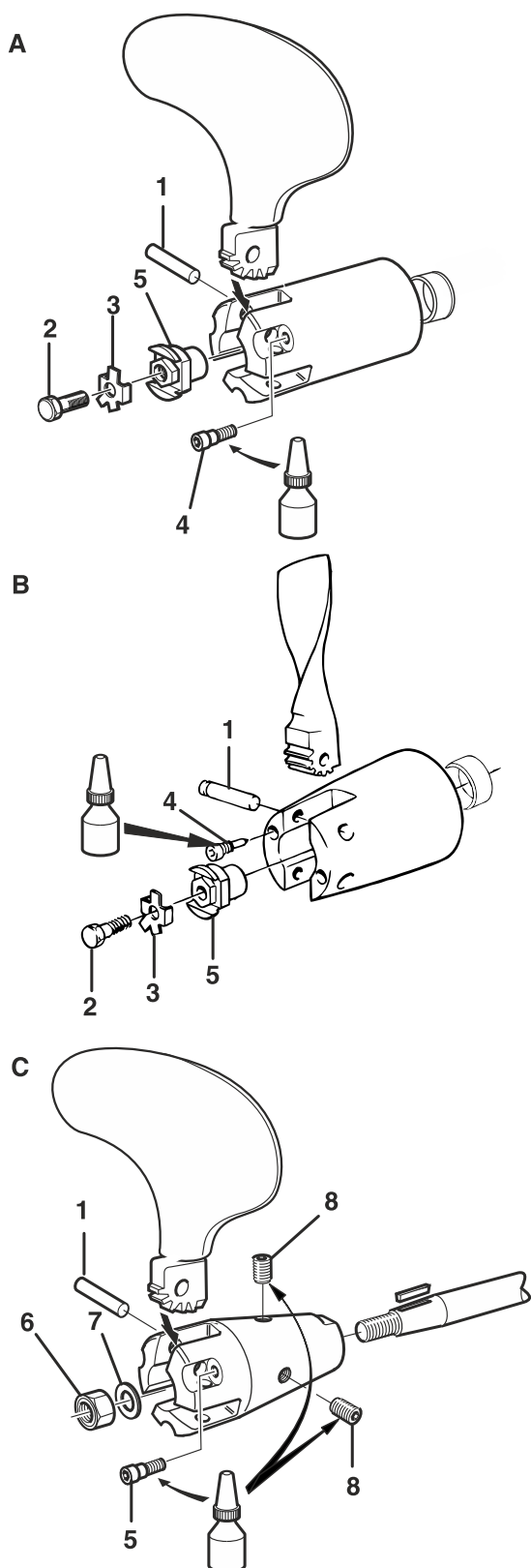
The propeller must be cleaned and greased once yearly. Remove the propeller and clean all parts thoroughly. Brush water resistant grease on the propeller blade cogs and bearing surfaces so that the propeller folds easily. Also brush water resistant grease on pins, spacer sleeves (stern drive), propeller shaft and in the propeller hub.

▲ WARNING!

Make sure the engine can not start during work on propeller(s); remove ignition key(s) and shift drive into forward or reverse.

Removal

- 1 Set the control lever to the "Ahead" position.
- 2 Disassemble the propeller blades by screwing out the lock screws (4) completely and then pressing out the pins (1).
- 3 **Drive:** Fold down the edge of the tab washer (3) and remove the lock screw (2), tab washer and nut (5).
Reverse gear: Remove the nut (6), washer (7) and then the lock screws (8).
- 4 Pull off the propeller hub and spacer sleeve (stern drive). Clean and grease the propeller.



P0007539

- A 3-bladed folding propeller (drive)
 B 2-bladed folding propeller (drive)
 C 3-bladed folding propeller (reverse gear)

Installation

- 1 Install the spacer sleeve (stern drive) and the propeller hub onto the shaft. Fit the propeller to the spacer sleeve.
- 2 **Drive:** Install the nut (5). Place a propeller blade in the hub and secure it with a wooden wedge between the propeller blade and hull. Tighten the nut to 70 Nm.
Reverse gear: Fit the washer (7) and tighten the nut (6) to 220 Nm. Apply thread locking fluid to the lock screws (8). Once the lock screws have been tightened, locking fluid should also be applied to their heads.
- 3 **Drive:** Place the tab washer (3) on the nut. Install and tighten the lock screw (2) to 20 Nm and bend one of the tab washer tabs against the bolt head. The tab washer (3) must be replaced if necessary. Only Volvo Penta original lock screws (2) or screws with the same quality may be used.
- 4 Install one propeller blade to the hub and press in the cotter pin (1) so that the groove in the pin is aligned with the lock screw hole (2). Apply thread locking fluid to the lock screw and tighten it to 10 Nm.
- 5 Install the blades the same way in consecutive order. Check that the blades have the same angle to the propeller shaft and that they move easily.

Storage

Have an authorized Volvo Penta workshop carry out checks on the engine and other equipment before the boat is put into winter storage. Make sure all necessary repairs and service are completed so that the boat is in top condition before the next season.

Conservation is performed to ensure that the engine and drive train are not damaged by non-use during winter storage. It is important that conservation is carried out in the correct manner, and that nothing is forgotten. For this reason, we have compiled a check list of the most important points.

⚠ CAUTION!

Read the chapter on Maintenance in the Operator's Manual before starting work. It contains instructions on how to carry out maintenance and service operations in a safe and technical correct manner.

The engine and other equipment must be inhibited to prevent damage if they are not to be used for two months or more. It is important that this is done in the correct manner, and that nothing is forgotten. For this reason, we have compiled a check list of the most important points.

Storage

It is best to carry out the following while the boat is still in the water:

- Change engine oil and oil filters.
- Replace oil in the reverse gear.
- Change the fuel filter. Replace the fuel pre-filter if such is fitted.
- Run engine to normal operating temperature.

It is best to carry out the following when the boat is out of the water:

- Clean the hull and stern drive immediately after the boat is taken out of the water (before they dry). Take care when cleaning with a high pressure jet. Never direct the water jet at the propeller shaft seal, grommets etc.
- Change oil in the drive.
- Clean the vacuum valve and seawater filter (accessory).
- Cleaning and conserving the raw water system.
- Removing the impeller from the raw water pump. Store the impeller in a sealed plastic bag and keep cool.
- Check the glycol content of the engine coolant. Top up as necessary.

IMPORTANT:

The use of anti-corrosion agent alone in the engine cooling system does not protect against freeze damage. If there is a risk of the engine being exposed to sub-freezing temperatures, the system must be drained.

- Empty the fuel tank of fuel, dirt and sludge. Fill the fuel tank completely, to avoid condensation.
- Clean the outside of the engine. Do not use a high pressure washer to clean the engine. Touch up any paint damage with Volvo Penta original paint.
- Check all control cables and treat with conservation agent.
- Make good an areas with paint work damage with Volvo Penta original paint. Read the instructions about painting the stern drive in the section *Storage, page 80*.
- Disconnecting the batteries. Clean and charge the batteries. An insufficiently-charged battery can freeze and burst.
- Spraying the components of the electrical system with water-repellent spray.
- Removing the propeller for winter storage. Grease the propeller shaft with water resistant grease, VP part # 828250.
- Check the rubber seal between the drive and hull.

Bringing Out of Storage

- Check the oil level in the engine and stern drive/ reverse gear. Top up as necessary. If the system contains conservation oil this must be drained, and the system must then be filled with oil. For the correct oil grade, refer to *Technical Data, Lubrication System*. Replace oil filter.
- Drain any antifreeze from the raw water system.
- Install the impeller in the raw water pump. Replace the old one if it displays signs of wear; refer to the chapter *Impeller, Check and Change, page 63*.
- Close and tighten drain taps and plugs.
- Check drive belt tensions and conditions.
- Check rubber hoses for condition and tighten hose clamps.
- Check the engine coolant and antifreeze. Top up as necessary.
- Connect the fully-charged batteries.
- Painting the sterndrive and hull bottom.
- Check the sacrificial anode on the stern drive. If less than 2/3 of the anode remain, it must be replaced. Clean with emery cloth shortly before launch.

IMPORTANT:

Use emery paper. Do not use a wire brush or other steel tools when cleaning, as these may damage the galvanic protection.

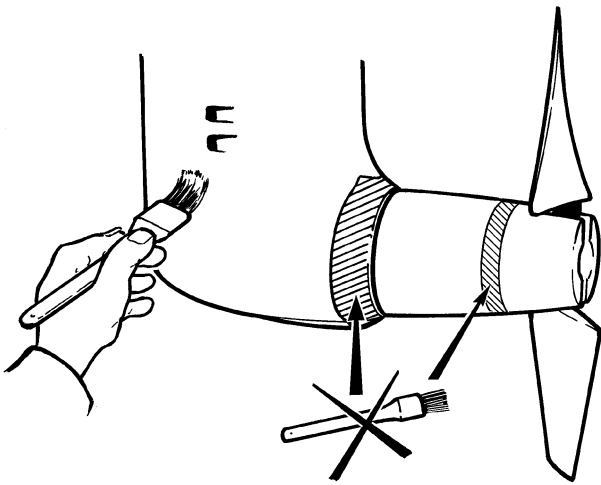
- Install the propellers
- Launch the boat. Check for leaks.
- Vent and grease the propeller shaft packing box (reverse gear).
- Start the engine. Check that there are no fuel, coolant or exhaust leaks and that all controls function.

Painting the Drive and Underwater Hull

Drive

Paint damage must be remedied before the stern drive is treated with anti-fouling agents.

Most countries have introduced legislation that regulates the use of anti-fouling agents. Anti-fouling agents must be approved for use in those waters where the boat will be deployed. Check what applies where you intend to use the boat. Where anti-fouling agents are not permitted, we recommend brushing pure Teflon®* on the original stern drive paint without prior sanding.



P0003083

- 1 Lightly sand metal surfaces using emery paper grade 120. Use a finer grade of paper on painted surfaces.
- 2 Wash with cellulose thinners or an equivalent.
- 3 Spackle and sand smooth any pores in the surface.
- 4 Paint with Volvo Penta original primer and paint. Allow to dry.
- 5 Paint the stern drive with anti-fouling agent for aluminum drives according to the manufacturer's recommendations.

IMPORTANT:

The sacrificial anodes on the drive must not be painted or treated with Teflon. This also applies to stainless or bronze propellers.

*Teflon is a registered trademark of the DuPont Corporation.

Boat hull

All paints containing anti-fouling agents are poisonous and damage the marine environment. Avoid these preparations. Most countries have introduced legislation that regulates the use of anti-fouling agents. Always follow these regulations. In many cases it is strictly forbidden to use anti-fouling agents on leisure craft.

On boats that are relatively easy to take out of water we recommend treatment using Teflon alone, in conjunction with mechanical cleaning several times per season. However, for larger boats this is not practicable. If the boat is in an area where the water causes fast fouling, paints with anti-fouling agents will most likely be necessary. In such cases, use copper-based paint that contains cuprous cyanide and not copper oxide.

Tin-based agents (TBT paints) may not be used. Find out about legislation applicable in the area where the boat is used. Allow the paint to dry before launching the boat.

Technical Data

Engine

Product sales designation	D2-50	D2-60	D2-75
Product designation	D2-50F	D2-60F	D2-75F
Crankshaft power, kW (hp) ⁽²⁾	37.5(50)	44(60)	55 (75)
Propeller shaft, kW (hp) ⁽³⁾	35(47)	42(57)	53 (72)
Displacement, l (in ³)	2.2 (134)	2.2 (134)	2.2 (134)
No. of cylinders	4	4	4
Bore/Stroke, mm (in)	84/100 (3.31/3.94)	84/100 (3.31/3.94)	84/100 (3.31/3.94)
Compression ratio	23.3:1	23.3:1	23.3:1
Engine Speed, rpm	3000	2700-3000	2700-3000
Idling speed rpm	850 ±25	850 ±25	850 ±25
Direction of rotation (seen from front)	Clockwise	Clockwise	Clockwise
Max. permissible rearward inclination in operation	20°	20°	20°
Max. side inclination in operation	30°	30°	30°
Engine, dry weight. kg (lb)	225 (496)	233 (514)	233 (514)

2. According to ISO 8665

3. According to ISO 8665

Lubrication System

Engine designation	D2-50	D2-60	D2-75
Oil volume incl. oil filter, no engine inclination, approx.	9.5 liters	9.5 liters	9.5 liters
Viscosity at -5° - +50 °C	SAE 15W/40, SAE 20W/50	SAE 15W/40, SAE 20W/50	SAE 15W/40, SAE 20W/50
Oil drain plug, tightening torque	30–40 Nm (22.1–29.5 lbf.ft.)	30–40 Nm (22.1–29.5 lbf.ft.)	30–40 Nm (22.1–29.5 lbf.ft.)

Oil grade ¹⁾	Oil change interval: Reached first in operation: ²⁾
VDS-3 VDS-2 and ACEA E7 ^{3), 4)} VDS-2 and Global DHD-1 ³⁾ VDS-2 and API CH-4 ³⁾ VDS-2 and API CI-4 ³⁾	400 hours or 12 months.

NOTICE! Mineral based oil, either fully or semi-synthetic, may be used on condition that it complies with the quality requirements above.

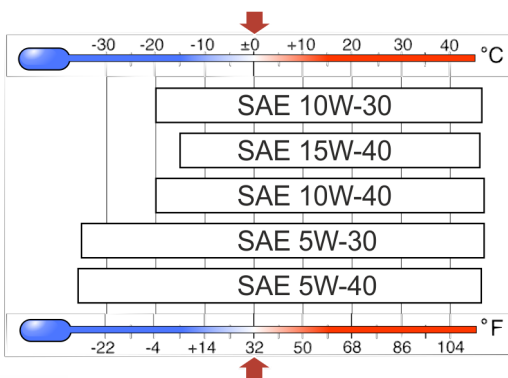
- 1) Lowest recommended oil grade. Higher grades oil may always be used.
- 2) If sulfur content is >1.0 % by weight, oil with TBN >15 must be used.
- 3) The lubricating oil must fulfill **both** requirements.
- 4) ACEA E7 has replaced ACEA E5, if the former is not available ACEA E5 may be used.
- 5) ACEA E3 may be replaced by ACEA E4, E5 or E7.
- 6) API CG-4 may be replaced with API CI-4.

- VDS** = Volvo Drain Specification
- ACEA** = Association des Constructeurs Européens d’Automobiles
- API** = American Petroleum Institute
- TBN** = Total Base Number
- Global DHD** = Global Diesel Heavy Duty

Viscosity

Select the viscosity according to the table.

The temperature values refer to stable ambient temperatures.



P0028382

Fuel quality requirements for diesel engines

General requirements

Volvo Penta diesel engines are certified for compliance with emission legislations with the diesel test fuels specified by law. These fuels correspond with diesel fuel standards EN 590, ASTM D975 and JIS K2204 and paraffinic diesel fuel standard EN 15940. Volvo Penta engines will be compliance with emission legislation, if the engine is maintained according to service instructions and used according to intended purpose.

It is the responsibility of the fuel suppliers to always ensure that their fuels meet relevant requirements and are fit for their intended purpose. Their responsibility includes any use of additives for proper engine performance and function.

Special requirements are placed on cold-flow properties, that is, temperature limit values of fuel filterability during operation in winter conditions.

Restrictions for specified diesel fuels

- **Max density for ASTM D975 No 2–D: 860 kg/m³**
Insufficient density reduces the power and increases the fuel consumption. Excessive density endangers the durability and function of the fuel injection equipment.
- **Max lubricity (wsd 1.4) for JIS K 2204: 460 μm**
Sufficient fuel lubricity is essential to protect the fuel injection system against excessive wear.

Restrictions for other diesel fuels

Volvo Penta also approves the use of other diesel fuels as long as the here specified restrictions are followed. However Volvo Penta does not guarantee compliance with emission legislation or fulfillment of expected lifetime with these other diesel fuels.

NOTICE! Operators must check permission for usage of these fuels according to regional, national or local regulations.

- **Min cetane number: 40**
An insufficient cetane number (“ignitability”) leads to poor startability and increased exhaust emissions.
- **Max density at 15°C: 860 kg/m³**
Insufficient density reduces the power and increases the fuel consumption. Excessive density endangers the durability and function of the fuel injection equipment.
- **Viscosity between 1.9 to 4.6 mm/s² at 40°C:**
Insufficient viscosity reduces the power and increases the fuel consumption. Excessive viscosity endangers the durability and function of the fuel injection equipment.
- **Max lubricity (wsd 1.4): 520 μm**
Sufficient fuel lubricity is essential to protect the fuel injection system against excessive wear.
- **Max FAME (biodiesel) content: 10% (V/V)**
FAME is blended into diesel fuel.
- **Max sulfur content: 5000 mg/kg**

Paraffinic fuels - HVO and GTL

Paraffinic diesel fuels (“Synthetic Diesel”) have higher cetane numbers and lower densities than diesel fuels. HVO (Hydrotreated Vegetable Oils) is renewable paraffinic fuels. GTL (Gas-To-Liquid) is fossil paraffinic fuels. Volvo Penta approves the use of paraffinic diesel fuels that complies with standard EN 15940. The fuel guarantees compliance with emission legislation and fulfills the expected lifetime as long as the service requirements are followed. Volvo Penta also approves the use of fuel blends between these paraffinic fuels and diesel fuels that comply with the quality requirements.

Service requirements HVO and GTL

When shifting from diesel fuel to paraffinic fuel, the fuel hoses and sealings must be replaced.

Cooling System

Freshwater system volume, approx.	9.5 liters	2.0 US gals
Thermostat		
starts to open at	83±2 °C	175–185°F
fully open at	92 °C	203 °F



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P0002463

Coolant, Mixing

⚠ WARNING!

All coolant is hazardous and harmful to the environment. Do not consume. Coolant is flammable.

IMPORTANT:

Always use the same type of coolant that is already in the engine.

Different types of coolant must not be mixed with each other.

Risk of reduced cooling function and performance by clogging and isolation.

Coolant shall be based on Organic Acid Technology (OAT).

Follow the mixing recommendation on the product.

The coolant should be mixed with distilled, deionized water. For Volvo Penta specified water requirements; refer to *Water Quality*.

NOTICE! Always use “Ready Mixed” coolant if water quality cannot be determined or if it does not fulfill ASTM D4985.

NOTICE! Never mix more than 60% concentrated coolant with water. A greater concentration provides reduced cooling effect with the risk for overheating and reduced freeze protection.

Water Quality

ASTM D4985:	
Total solid particles	<340 ppm
Total hardness	<9,5° dH
Chloride	<40 ppm
Sulfate	<100 ppm
pH value	5.5–9
Silica (acc. ASTM D859)	<20 mg SiO ₂ /l
Iron (acc. ASTM D1068)	<0.10 ppm
Manganese (acc. ASTM D858)	<0.05 ppm
Conductivity (acc. ASTM D1125)	<500 µS/cm
Organic content, COD _{Mn} (acc. ISO8467)	<15 mg KMnO ₄ /l

Electrical System

System voltage	12 V
Battery capacity (starter battery)	70 Ah
Alternator	
voltage/max. current	14 V/115 A
power, approx.	1610 W
Starter motor, power, approx.	2.0 kW

Reverse Gear

Type designation	MS25L	MS25A	HS25A-B
Gear ratio			2.29:1, 2.71:1
Right rotation (position A)	2.10:1, 2.72:1	2.74:1	
Left rotation (position B)	2.27:1, 2.74:1	2.23:1, 2.74:1	
Angle, output shaft			
MS25L/A, HS25	0°	8°	8°
Oil capacity	1.05 litre (1.1 US quarts)	0.75 litre (0.79 US quarts)	1.8 litre (1.9 US quarts)
Oil quality	SAE 15W-40	SAE 15W-40	ATF (Dexron II, III)
Weight	11 kg (24 lbs)	16 kg (35 lbs)	16 kg (35 lbs)

S-drive

Type designation	130S-B, 130SR-B	150S-B, 150SR-B
Gear ratio	2.19:1	2.19:1
Oil volume, approx.	2.9 liters	3.0 liters
Oil quality	SAE 15W-40	SAE 15W-40
Weight	26.5 kg	27 kg
Tightening torque, oil drain plug	10 ±5 Nm	10 ±5 Nm

Type designation	130S-C, 130SR-C	150S-C, 150SR-C
Gear ratio	2.19:1	2.19:1
Oil volume, approx.	3.3 liters	3.4 liters
Oil quality	SAE 15W-40	SAE 15W-40
Weight	32 kg	34 kg
Tightening torque, oil drain plug	10 ±5 Nm	10 ±5 Nm

Identification Numbers

There are type plates on the engine and transmission, marked with identification numbers. This information must always be used as reference when service and spare parts are ordered. You will probably find similar plates on your boat and its equipment. Note this information below, make a copy of the page and store it in a safe place, so that you can have the information available if the boat is stolen.

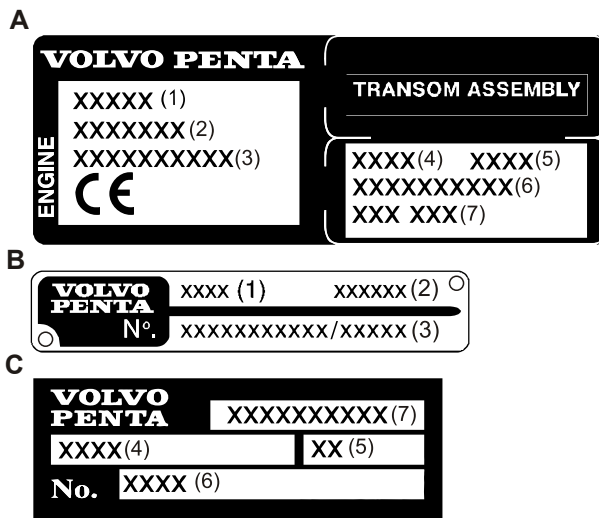
The appearance and location of the type plates is shown below. The figures in brackets refer to the location of the identification number on the type plate.

Engine

Product designation (1):
 Product number (2):
 Serial number (3):

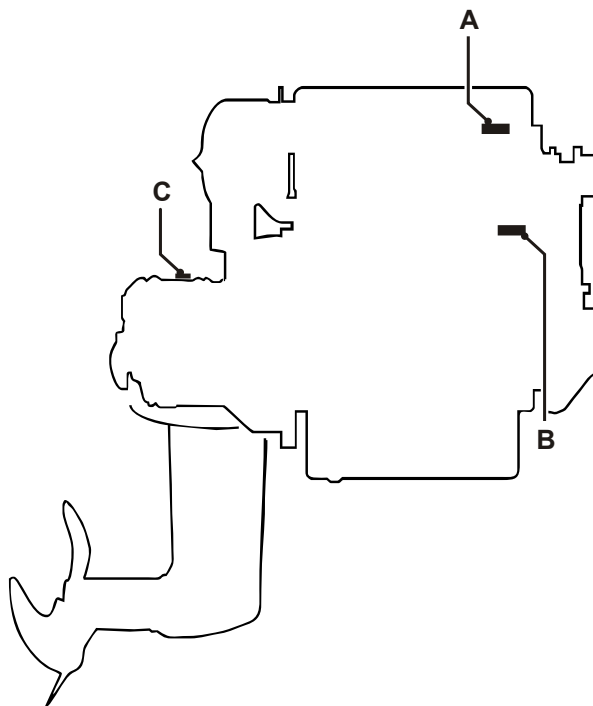
Transmission

Product designation (4):
 Gear ratio (5):
 Serial number (6):
 Product number (7):



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- A Engine and transmission decal
- B Engine plate
- C Transmission plate



P0007819

VOLVO PENTA

Declaration of Conformity for Recreational Craft Propulsion Engines with the exhaust emission requirements of Directive 2013/53/EU

D2

Engine manufacturer

AB Volvo Penta
Gropegårdsgatan
405 08 Göteborg
Sweden

Body for exhaust emission assessment

TÜV SÜD Product Service GmbH
Ridlerstrasse 65
80339 München
Germany
ID Number: 0123

Modules used for exhaust emission assessment.....B + C

Other Community Directives applied: EMC 2014/30/EU

Description of engine(s) and essential requirements:

Type of engine 4 stroke diesel engine

Engine model(s) covered by this declaration**Engine model(s)****EC Type certificate number**

D2-60F

D2-75F.....SB5A 16 11 66019 016

Essential requirements	Standards Used	Other normative document used
Annex I.B - Exhaust Emissions		
Engine identification	Volvo Penta std	Annex I.B.1
Exhaust emission requirements	EN ISO 18854:2015	Annex I.B.2
Durability	Volvo Penta std	Annex I.B.3
Operator's Manual	ISO 10240:2004	Annex I.B.4
EMC Directive	EN 61000-3-2, EN 61000-3-3, CISPR25	

This declaration of conformity is issued under the sole responsibility of the manufacturer. I declare on behalf of the engine manufacturer that the engine(s) mentioned above complies with all applicable essential requirements in the way specified and is in conformity with the type for which above mentioned EC type examination certificate(s) has been issued.

Name and function: Tom Tveitan, Laws and Regulations
(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative)

Signature and title:
(or an equivalent marking)



Date and place of issue: (yr/month/day) 2016/11/28 Göteborg

LR-27/16-01

VOLVO PENTA

Declaration of Conformity for Recreational Craft Propulsion Engines with the exhaust emission requirements of Directive 2013/53/EU D2-50

Engine manufacturer

AB Volvo Penta
Gropegårdsgatan
405 08 Göteborg
Sweden

Body for exhaust emission assessment

DNV GL SE Approval
Brooktorkai 18
20457 Hamburg
Germany
ID Number: 0098

Modules used for exhaust emission assessment.....B + C

Other Community Directives applied: EMC 2014/30/EU

Description of engine(s) and essential requirements:

Type of engine 4 stroke diesel engine

Engine model(s) covered by this declaration**Engine model(s)****EC Type certificate number**

D2-50F.....RCDB000006Z

Essential requirements	Standards Used	Other normative document used
Annex I.B - Exhaust Emissions		
Engine identification	Volvo Penta std	Annex I.B.1
Exhaust emission requirements	EN ISO 18854:2015	Annex I.B.2
Durability	Volvo Penta std	Annex I.B.3
Operator's Manual	ISO 10240:2004	Annex I.B.4
EMC Directive	EN 61000-3-2, EN 61000-3-3, CISPR25	

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(identification of the person empowered to sign on behalf of the engine manufacturer or his authorized representative)

Signature and title:
(or an equivalent marking)



Date and place of issue: (yr/month/day) 2017/06/14 Göteborg

LR-04/17-01

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A series of 20 horizontal dotted lines spanning the width of the page, providing a guide for handwriting practice.

ENG

This Operator's Manual may be ordered in a different language free of charge up to 12 months after delivery, via internet.

<http://manual.volvopenta.com/coupon/>

If internet access isn't possible, please contact your Volvo Penta dealer.

GER

Diese Betriebsanleitung kann bis zu 12 Monate nach der Lieferung über Internet kostenlos in einer anderen Sprache bestellt werden.

<http://manual.volvopenta.com/coupon/>

Wenn Sie keinen Internet-Zugriff haben, kontaktieren Sie bitte Ihren Volvo Penta-Händler.

FRE

Ce manuel d'utilisation peut être commandé gratuitement sur Internet en différentes langues, jusqu'à 12 mois après la date de livraison.

<http://manual.volvopenta.com/coupon/>

Veuillez contacter votre Distributeur Volvo Penta si vous avez un problème d'accès à l'Internet.

SPA

El presente libro de instrucciones puede solicitarse en otro idioma diferente, libre de cargo, hasta 12 meses después de la entrega, mediante internet.

<http://manual.volvopenta.com/coupon/>

Si no se tiene acceso a internet, contacten al su concesionario Volvo Penta.

ITA

Il manuale per l'operatore può essere ordinato tramite Internet, in varie lingue e per consegna gratuita, entro 12 mesi dalla consegna del prodotto

<http://manual.volvopenta.com/coupon/>

Se l'accesso a Internet risulta impossibile, contattare la concessionaria Volvo Penta.

SWE

Denna instruktionsbok kan beställas via internet på ett annat språk gratis i upp till 12 månader efter leverans.

<http://manual.volvopenta.com/coupon/>

Kontakta din Volvo Penta-återförsäljare om du inte har tillgång till internet.

DUT

Dit instructieboek kan gratis via internet in een a dere taal worden besteld tot 12 maanden na aflevering.

<http://manual.volvopenta.com/coupon/>

Als toegang tot het internet niet mogelijk is, neem dan contact op met uw Volvo Penta dealer.

DAN

Denne instruktionsbog kan bestilles gratis på et andet sprog via Internettet i op til 12 måneder efter leveringen.

<http://manual.volvopenta.com/coupon/>

Hvis det ikke er muligt at bestille via Internettet, bedes du kontakte din Volvo Penta forhandler.

FIN

Tämä käyttöohjekirja on tilattavissa Internetin kautta veloituksetta eri kielillä 12 kuukauden ajan toimituksen jälkeen.

<http://manual.volvopenta.com/coupon/>

Jos sinulla ei ole Internet-yhteyttä, ota yhteys lähimpään Volvo Penta jälleenmyyjään.

POR

Este Manual do Operador pode ser encomendada em idiomas diferentes isento de custos até 12 meses após entrega, via internet.

<http://manual.volvopenta.com/coupon/>

Se não for possível aceder à internet, contacte o seu concessionário Volvo Penta.

GRC

Το παρόν Βιβλίο Χρήσης μπορεί να παραγγελθεί δωρεάν σε άλλη γλώσσα μέχρι 12 μήνες μετά την παράδοση, μέσω διαδικτύου.

<http://manual.volvopenta.com/coupon/>

Εάν δεν είναι δυνατή η πρόσβαση στο ιαδίκτυο, παρακαλούμε επικοινωνήστε με το δικό σας αντιπρόσωπο της Volvo Penta.

RUS

Данное руководство по эксплуатации можно бесплатно заказать на другом языке по Интернету в течение 12 месяцев после доставки.

<http://manual.volvopenta.com/coupon/>

Если доступ к Интернету отсутствует, обратитесь к своему дилеру компании Volvo Penta.

TUR

Bu Kullanım Kılavuzu, teslimden 12 ay sonrasına kadar İnternet yoluyla ücretsiz olarak farklı bir dilde sipariş edilebilir.

<http://manual.volvopenta.com/coupon/>

İnternet mümkün değilse, lütfen Volvo Penta yetkili satıcınızla temasa geçin.

CHI

本操作手册可通过互联网以不同的言进行订购，交付后可免费使用达12个月。

<http://manual.volvopenta.com/coupon/>

如果无法访问互联网，请与沃尔沃遍达经销商联系。

BZS

Este Manual de operador pode ser encomendado em um idioma diferente, gratuitamente, até 12 meses após a entrega, via internet.

<http://manual.volvopenta.com/coupon/>

Caso o acesso à internet não for possível, contatar seu distribuidor Volvo Penta.

JPN

このオペレーターズ マニュアルの他言語版が、発行後

最高12か月間、インターネットより無料で発注可能です。

<http://manual.volvopenta.com/coupon/>

インターネットにアクセスできない場合は、担当のボルボペンタディーラーまでご連絡ください。

ARA

من الممكن طلب دليل المشغل بلغة أخرى مجانًا عبر الإنترنت لفترة تصل إلى ١٢ شهرًا من بعد التسليم.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

إذا كان الوصول إلى الإنترنت غير متاح، فالرجاء الاتصال بوكيل Volvo Penta.

**VOLVO
PENTA**

AB Volvo Penta
SE-405 08 Göteborg, Sweden
www.volvopenta.com

