Workshop manual

Group 21–26

Marine engines

D3-110i-B, D3-130i-B, D3-160i-B, D3-190i-B
D3-130A-B, D3-160A-B, D3-190A-B

Contents

General information

About this Workshop Manual

This workshop manual contains technical data, descriptions and repair instructions for the following marine diesel engines: D3-110i-B, D3-130i-B, D3-160i-B, D3-190i-B, D3-130A-B, D3-160A-B, D3-190A-B.

The engine designation and number are noted on the number plate and engine decal. The engine designation and number must always be given in all correspondence about any product.

The Workshop Manual is produced primarily for the use of Volvo Penta workshops and service technicians. This assumes that people who use the Manual have basic knowledge of marine drive systems and can do the tasks of a mechanical or electrical nature associated with the trade.

Volvo Penta constantly improves its products, so we reserve the right to make modifications without prior notification. All information in this manual is based on product data which was available up to the date on which the manual was printed. Any material changes introduced into the product or service methods after this date are notified by means of Service Bulletins.

Standard times (Flat Rate)

In instructions where operation numbers are found in the headings, this is a reference to the Volvo Penta standard times list (“Flat Rate”).

Spare parts

Spare parts for electrical- and fuel systems are subject to various national safety requirements, such as U.S. Coast Guard Safety Regulations. Volvo Penta Original Spare Parts meet these specifications. Any damage, occasioned by use of non--original Volvo Penta spares for the product, will be not be compensated by the warranty offered by Volvo Penta.

Certified engines

When doing service and repair on emission certified engines, it is important to be aware of the following:

Certification means that an engine type has been checked and approved by the relevant authority. The engine manufacturer guarantees that all engines made of the same type are equivalent to the certified engine.

This makes special demands on service and repair work, as follows:

– Maintenance and service intervals recommended by Volvo Penta must be complied with.

– Only by Volvo Penta approved spare parts may be used.

– Service to injection pumps, pump settings and injectors must always be done by an authorized Volvo Penta workshop.

– The engine must not be converted or modified, except for the accessories and service kits which Volvo Penta has approved for the engine.

– No installation changes to the exhaust pipe and engine air inlet ducts may be done.

– No seals on the engine may be broken by unauthorized persons.

The general advice in the instruction book about operation, care and maintenance applies.

⚠ **IMPORTANT!** Late or inadequate maintenance/ service or the use of spare parts other than by Volvo Penta approved spare parts will invalidate AB Volvo Penta’s responsibility for the engine specification being in accordance with the certificated variant.
Volvo Penta accepts no responsibility or liability for any damage or costs arising due to the above.

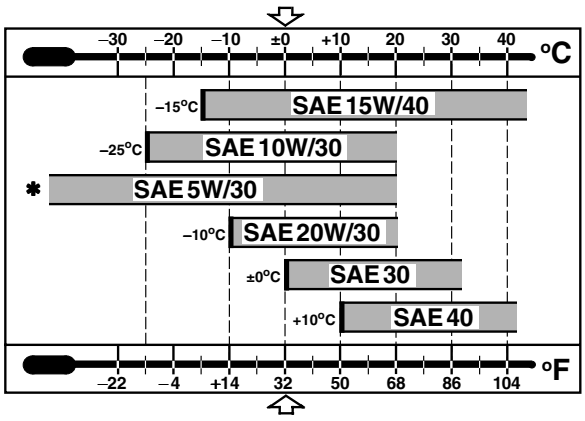
Group 22 Lubrication system

Oil grades

D3	Sulfur in fuel, percentage by weight	
	<1%	> 1.0% [1]
Oil grade [2]	Oil change interval reached first in operation	
VDS-2 **and** ACEA E7 [3] or VDS-2 **and** Global DHD-1 or VDS-2 **and** API CH-4 or VDS-2 **and** API CI-4	**200 h** or 12 months	**100 h** or 12 months

1) If sulfur content is > 1.0% by weight, use oil with TBN > 15.
2) Contains the specifications for oil grades **"and"** the engine oil must comply with both requirements.
3) ACEA E7 has replaced ACEA E5. If ACEA E5 is available, it can be used.

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



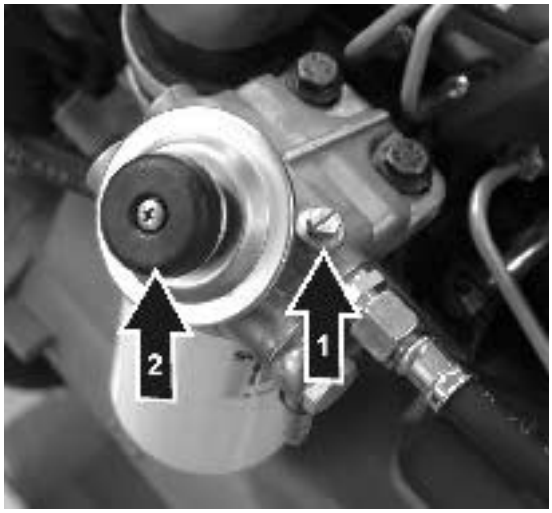
Viscosity

Select the viscosity from the adjacent table, for the appropriate continuous ambient air temperature.

* Refers to synthetic or semi-synthetic oils.

Oil change volume

Please refer to the "Technical Data" chapter.



Flat Rate: 23080

Venting the fuel system

⚠ **WARNING!** Never loosen a fuel pipe or component downstream from the high pressure pump to vent air. The fuel is under very high pressure and can force its way through your skin.

1. Open the vent screw (1) located above the fuel filter bracket.

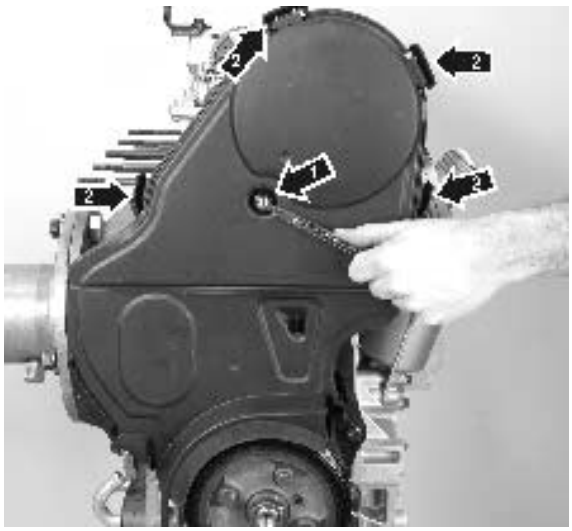
NOTE! Check whether the copper washer on the vent screw needs to be changed.

2. Press the hand pump (2) located on the fuel filter bracket until fuel with no air bubbles comes out of the vent screw. Keep pumping at the same time as the vent screw is closed.

   Pump another 10 strokes.

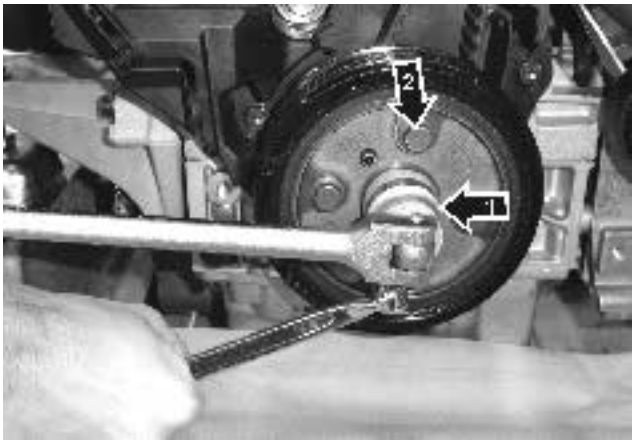
3. Wipe up the fuel that has run out.

   Start the engine and check for leakage.

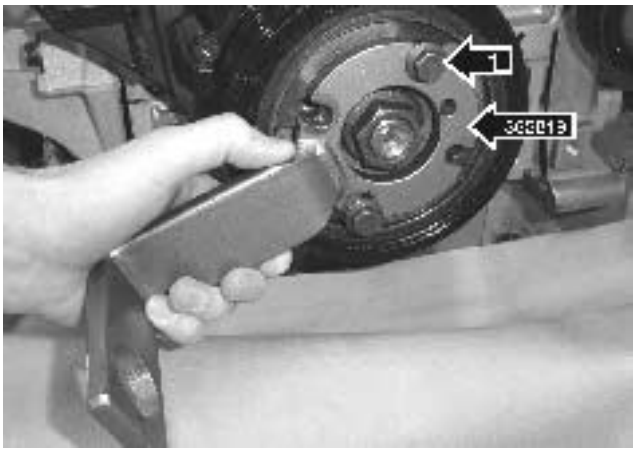


22. **Timing gear**

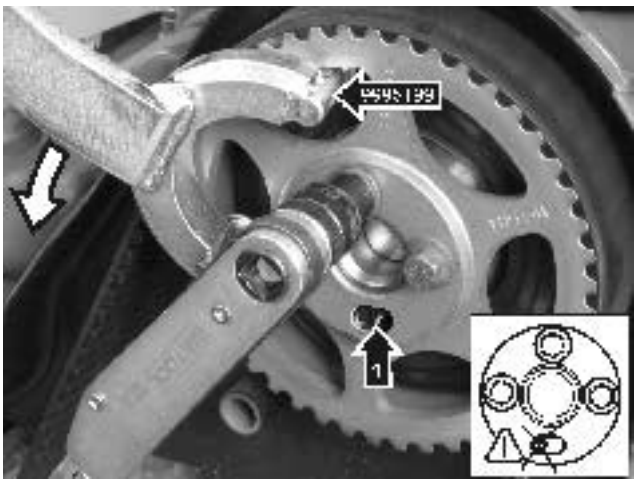
    Undo the outer timing gear cover screw (1) and the four hooks (2). Fold the top of the cover forwards and then lift the cover upwards.



23. Use a socket (1) as a counterhold on the center nut. Then undo all the screws on the vibration damper (2).



24. Install the counterhold tool 885819, using the four screws (1) for the vibration damper.

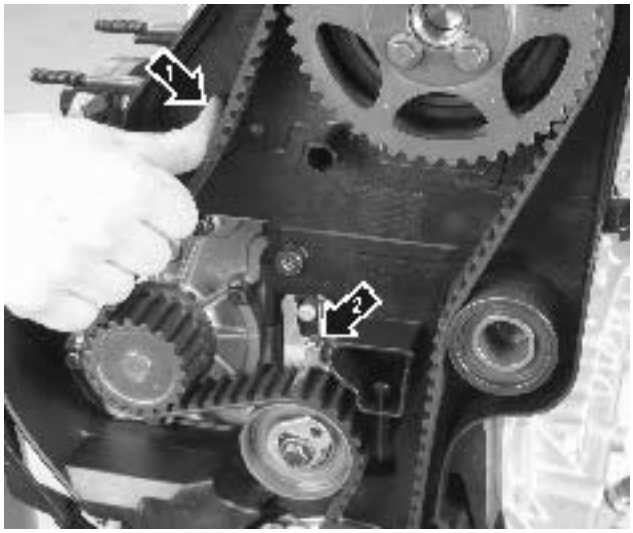


35. Check that the open screw hole (1) is not in the end position in relation to the elongated hole. If the screws are in their end position, it will not be possible to tension the toothed belt correctly.

    Tension the toothed belt in the direction of the arrow, using counterhold 9995199 and fix the camshaft pulley with the three screws. Torque the screws as specified in “Technical data.”

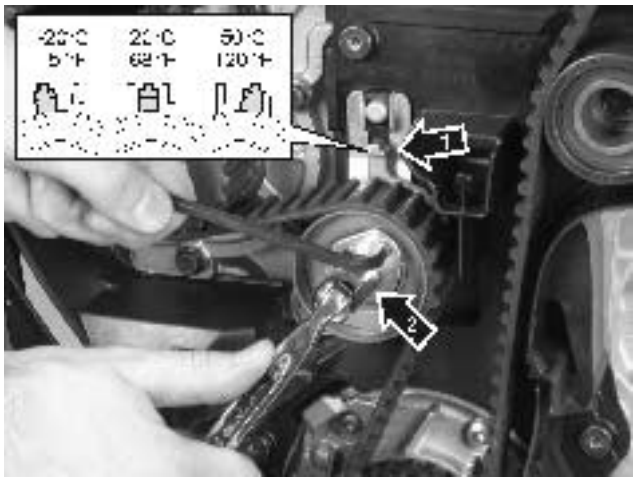
    Fit the last screw and torque as specified in “Technical data.”

⚠ **IMPORTANT!** Make sure that the toothed belts are taut between the crankshaft, jockey wheel and camshaft pulley during tightening.



36. Apply pressure (1) to the toothed belts and check that the belt tensioner (2) moves.

NOTE! The belt tensioner must be changed if it does not move.



37. Remove locking pins 9997005 and 9997007 and install the plug in the block.

    Set the belt tensioner in relation to the temperature of the engine block, please refer to the figure.

    Torque the belt tensioner as specified in “Technical data”.

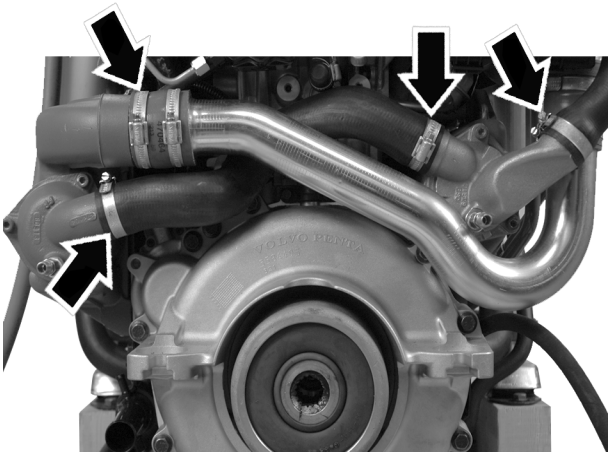
NOTE! The illustration shows the temperature of the engine block when the belt tensioner is set up.

Overhaul / Change components

Group 21: Short block

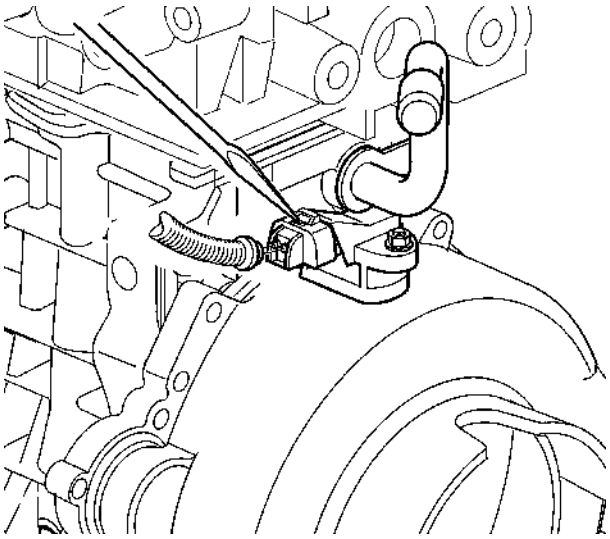
Flywheel, change

Current disconnected. Sea-water system drained.

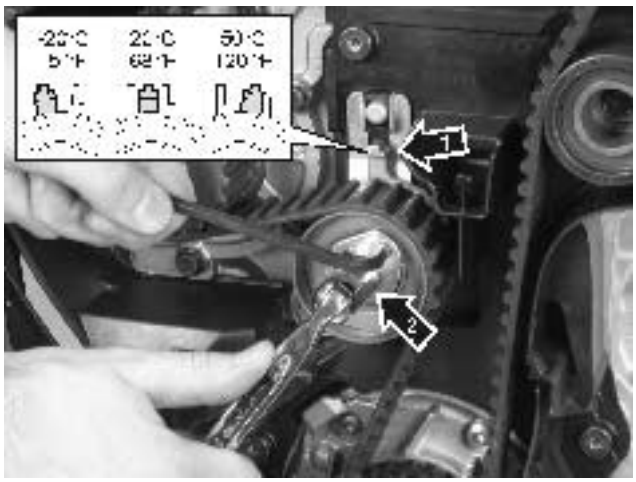


Removal

1. Remove the charge air pipe from the turbo and the cooling hose over the flywheel housing.

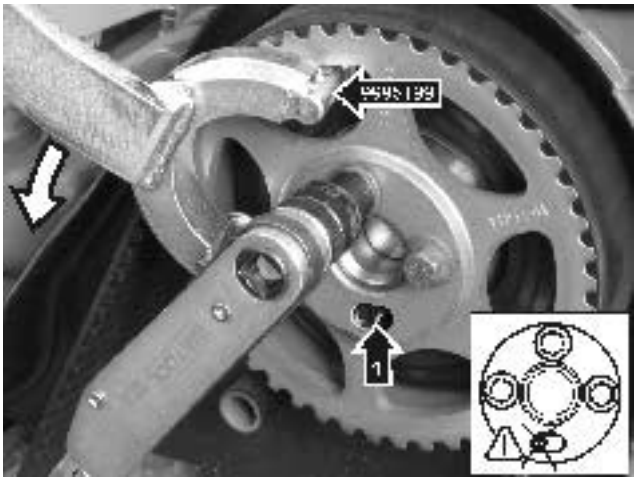


2. Undo the connector for the flywheel sensor and remove the flywheel sensor with anchorage.



37. Set the belt tensioner to the tensioned position (1). Then tighten the screws (2). No fine adjustment is necessary at this point. The illustration shows the position of the belt tensioner at various temperatures of the engine block.

    Check that lock pins 9997007 for the exhaust camshaft and 9997005 for the crankshaft are in place, please refer to “Crankshaft, locking”.

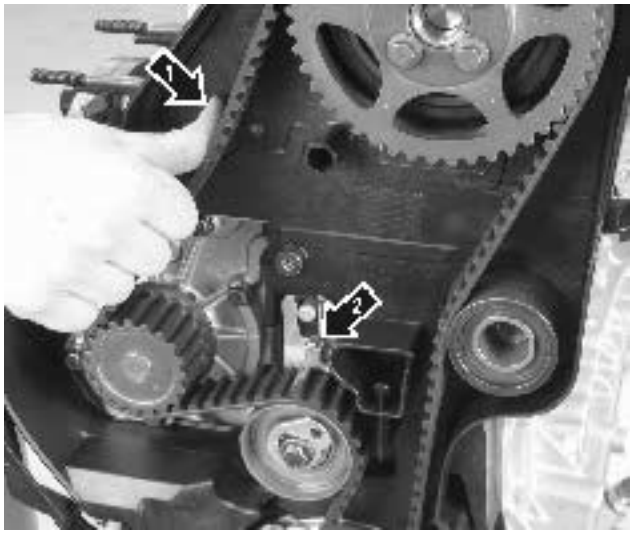


38. Check that the open screw hole (1) is not in the end position in relation to the elongated hole. If the screws are in their end position, it will not be possible to tension the toothed belt correctly.

    Tension the toothed belt in the direction of the arrow, using counterhold 9995199 and fix the camshaft pulley with the three screws. Torque the screws as specified in “Technical data.”

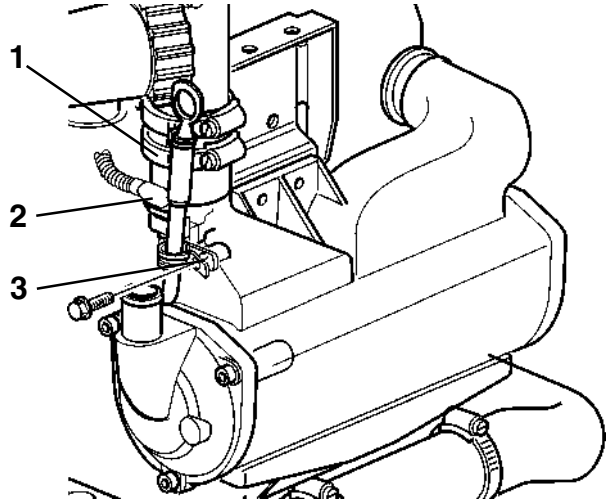
    Fit the last screw and torque as specified in “Technical data.”

⚠ **IMPORTANT!** Make sure that the toothed belts are taut between the crankshaft, jockey wheel and camshaft pulley during tightening.



39. Apply pressure (1) to the toothed belts and check that the belt tensioner (2) moves.

NOTE! The belt tensioner must be changed if it does not move.



57. Install the intercooler on the bracket. Insert the short hose (1) between the induction manifold and the intercooler before the screws are tightened.

    Join up the connector for the intercooler sensor (2) and tighten the dipstick clamp (3) to the intercooler.

NOTE! Install the fuel return hose on one of the intercooler screws.

⚠ **IMPORTANT!** Make sure that the hoses are installed so they do not chafe against anything.

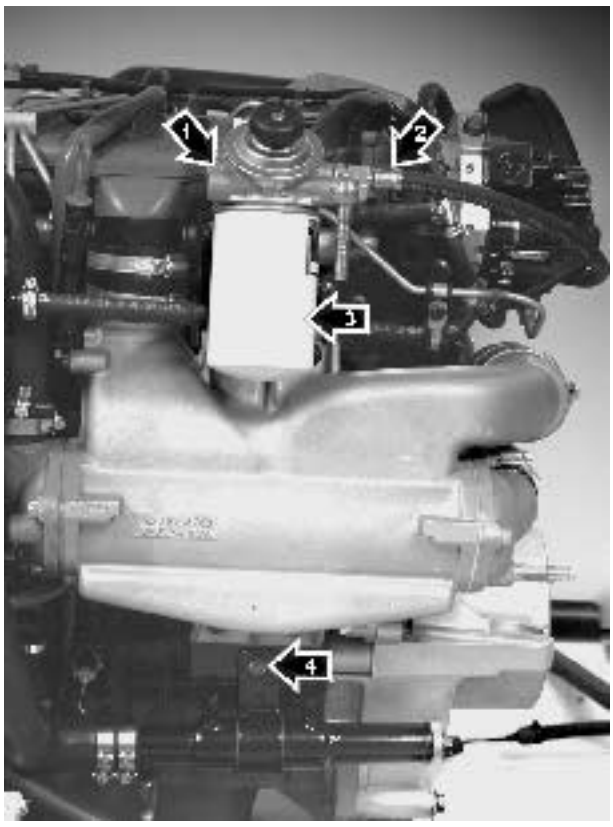
58. Install the oil cooler (servo) or joining pipe.

    Install the air filter housing (1) on the turbocharger.

    Connect the turbocharger vacuum hose and crankcase ventilation (2).

    Install the charge air pipe (3) between the turbocharger and the intercooler.

59. Install all coolant hoses (4) to the sea water pump, intercooler, heat exchanger, exhaust pipe elbow, exhaust manifold, expansion tank, oil coolers, thermostat housing and coolant pipes.



60. Screw the fuel filter housing (1) in place. Connect the fuel pipe (2) between the high pressure pump and the fuel filter housing.

    Install a new fuel filter (3).

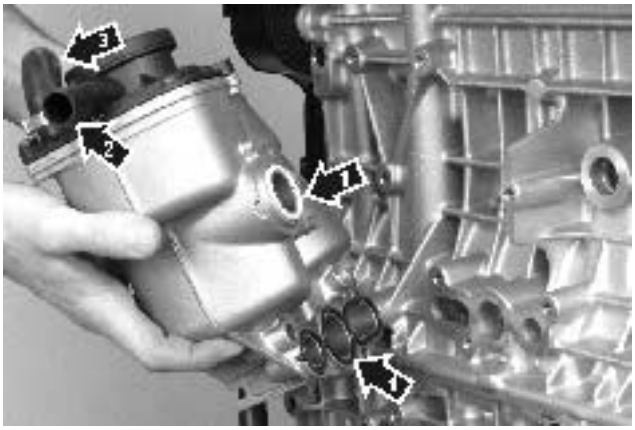
    Install the oil cooler (servo) bracket (4) or joining pipe to the bracket under the intercooler.

    Install new tie wraps on the cables and hoses, as previously noted.

Oil filter housing, change

1. Remove the charge air cooler. Install hoses between the oil filter housing and the crankcase ventilation.

2. Unscrew the oil filter housing and remove it.



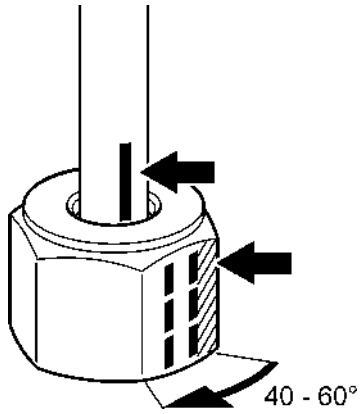
3. Check that the sealing surfaces on the new filter housing are clean and install oiled seal rings (1). Torque the filter housing as specified in “Technical data.”

4. Connect the hoses from the crankcase ventilation to the filter housing and install the intercooler.

6. Fit the new delivery pipes. Screw all cap nuts all the way down by hand.

7. Angle tightening of cap nuts

⚠ **IMPORTANT!** When torquing nuts to 40° - 60° angle, a torque wrench must be used, adjusted to 45 Nm. It is important that you do **not** exceed 45 Nm.



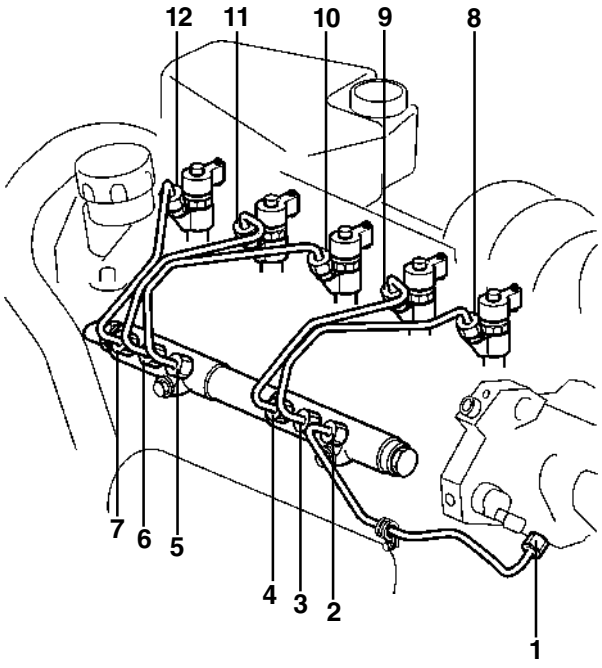
⚠ **IMPORTANT!** If the torque becomes too great before reaching the correct angle, the connection must be removed and lubricated with engine oil before it is torqued again. If the torque again exceeds 45 Nm, the delivery pipes must be replaced with new ones.

The nut is hexagonal and each corner is 60°.

Mark the pipe and one side of the nut using a pen as illustrated. The side of the nut is divided into three equal parts, which correspond to 20° each.

NOTE! The mark should not be made until the nut has been torqued to 28 Nm.

When the line on the pipe faces the right section, the torque angle will be between 40° and 60°.



8. Torquing cap nuts

Torque all cap nuts (1-12) to 28 Nm.

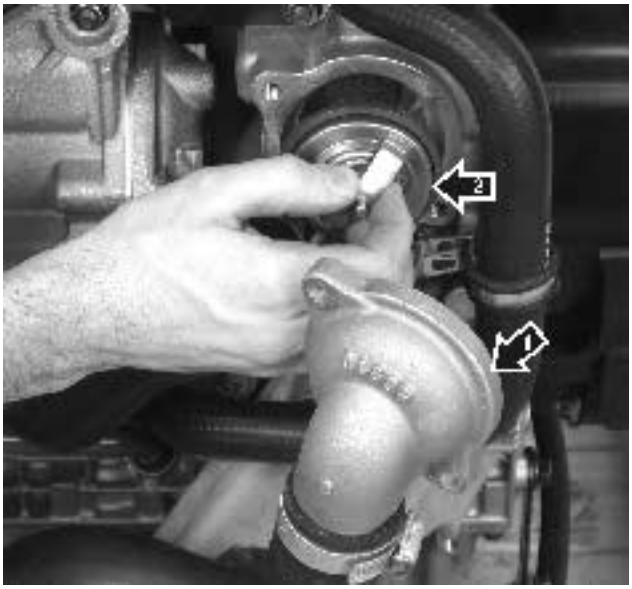
Set torque wrench to 45 Nm and torque the cap nuts (1-7) to 40° - 60° angle.

NOTE! Do not torque the cap nuts (8-12) using angle tightening.

Tightening torque **must not** not exceed 45 Nm, see step 7.

Flat Rate: 26271 R & R
Flat Rate: 26273 Test

Thermostat, function check/ change



Drained coolant

1. Undo the thermostat housing (1).

   Remove the thermostat (2) and seal.

2. If inspection is to be done:

   Put the thermostat in a water filled glass beaker. Heat the water to boiling point and use a thermometer to check the temperature at which the thermostat opens.

   The thermostat should start to open at 80°C and should be fully open at 95°C.

3. Clean the sealing surfaces of the thermostat housing and the cover.

⚠ **IMPORTANT!** Be careful not to damage the sealing surfaces during cleaning.

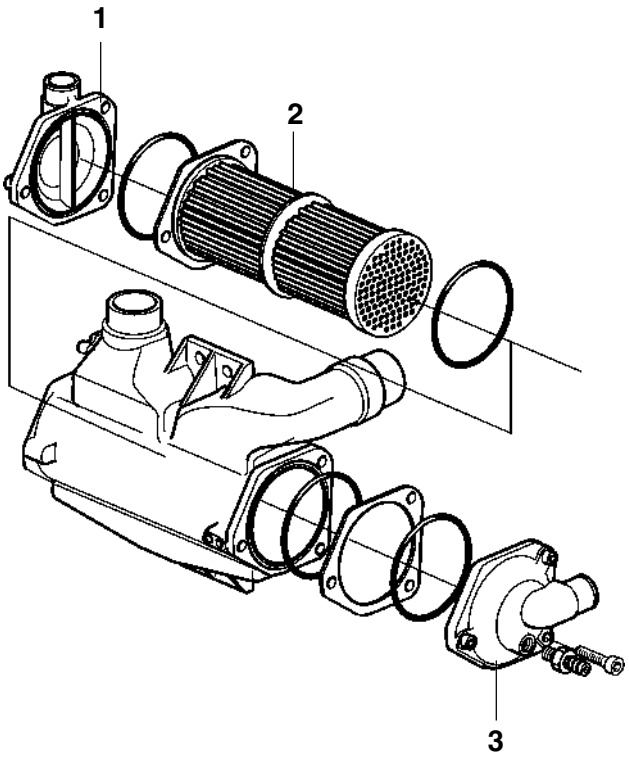
4. Place a new or checked thermostat in the housing together with a new seal.

   Torque the cover to the specified value.

5. Fill the cooling system up and check that there is no leakage.

Flat Rate: 25061

Intercooler, cleaning/ renovation



Intercooler removed.

1. Unscrew the cover (1) with washer and O-rings.

   Unscrew the cover (3).

   Remove the insert (2), and all O-rings.

2. Clean all components. Use a bottle brush etc. to clean the insert ducts.

⚠ **IMPORTANT!** The intercooler sealing surfaces and the soldered joints in the insert must not be subjected to mechanical wear during cleaning.

3. Re-install the components with new O-rings.

   Do a pressure test, please refer to ”Intercooler, pressure testing”.