

Document Title: <b>Description</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/6/22</b>
Profile:			

## Description

The EC15/EC20B is powered by a water-cooled 3-cylinder four-stroke inline diesel engine with water cooling.

Document Title: <b>Engine trouble shooting</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/6/22</b>
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## Engine trouble shooting

Engine faults must be detected and rectified as quickly as possible in order to avoid more expensive repairs. The following table summarizes the most important faults and their rectification.

Problem/fault	Possible cause of fault	Fault remedy
Engine does not start	Starter switch defective	Tighten connections. Replace the switch.
	Starter power too low	If the starter is OK, check condition of battery and electric connections.
	Air in fuel system	Bleed the system.
	Air filter dirty	Replace the air filter.
	Wrong oil viscosity	Check viscosity and fill in correct oil.
	Engine too cold	Check the function of the preheater plug.
	Injection valves defective	Check and adjust the injection valves Replace defective valves.
	Incorrect injection timing	Adjust the injection timing. Check the valve clearance.
Engine shuts down automatically	Compression pressure too low	Check condition of cylinder head gasket, valves and piston rings.
	Fuel tank empty	Fill in fuel.
	Air in fuel system	Bleed the fuel system.
	Fuel filter dirty	Clean or replace the fuel filter.
	Fuel pump defective	Check connection of fuel pump or replace fuel pump.
Erratic running of engine	Exhaust system clogged	Clear or replace the exhaust system.
	Fuel pump defective	Replace the pump.
	Fuel filter dirty	Clean or replace the fuel filter. Bleed the fuel system.
	Air filter dirty	Clean the air filter. Check the intake air.
Engine overheating	Injection valves defective	Check and adjust the injection valves Replace defective valves.
	Cooling system elements defective	Check elements (water pump, radiator, thermostat, cylinder head gasket, coolant hoses).
	Fan not running	Check presence, tension and cleanliness of V-belt.
	Lubrication system elements defective	Check elements (oil filter, oil pump, suction filter) and replace defective parts.
	Incorrect injection timing	Adjust the injection timing. Check the valve clearance.
	Oil level too low	Fill in oil. Check whether the oil in the engine meets the operating conditions.
	Governor incorrectly adjusted	Adjust the governor.
Engine develops black smoke	Coolant level not correct	Correct the coolant level. Check whether the coolant meets the operating conditions.
	Air cleaner soiled	Clean or replace the air filter.
	Poor fuel quality	Check quality of fuel and suitability for climatic

		conditions.
Irregular idle speed	Valve clearance and injection timing not correct	Adjust valve clearance and injection timing.
	Compression pressure not O.K.	Check condition of cylinder head gasket, valves and piston rings.
	Injection pressure not O.K.	Check and adjust the injection valves
	Injection pump defective	Check injection pump, replace if necessary.
	Engine control cable incorrectly adjusted	Adjust the control cable.
	Poor engine oil quality	Fill in oil as required for the operating conditions.
	Poor fuel quality	Check quality of fuel and suitability for climatic conditions.
	Valve clearance and injection timing not correct	Adjust valve clearance and injection timing.
	Opening pressure of injection valves not correct	Check opening pressure and injection valves.
	Compression pressure not O.K.	Check condition of cylinder head gasket, valves and piston rings.
Unusual engine noise	Injection pump defective	Check injection pump, replace if necessary.
	Poor fuel quality	Check quality of fuel and suitability for climatic conditions.
	Air cleaner soiled	Clean or replace the air filter.
	Incorrect injection timing	Adjust the injection timing.
	Engine shut-down solenoid not O.K.	Check the engine shut-down solenoid.
	Injection pressure not O.K.	Adjust the injection valves.
	Compression pressure not O.K.	Check condition of cylinder head gasket, valves and piston rings.
Oil pressure too low	Injection pump defective	Replace the injection pump.
	Oil level and oil quality not correct	Check oil level and oil quality and fill in specified oil.
Battery charge condition too low	Oil pressure switch defective	Check and replace the oil pressure switch.
	Fan V-belt too loose	Tighten the V-belt and replace a defective V-belt.
	Generator defective	Check and replace the generator.
	Battery defective	Replace the battery.
	Wiring not O.K.	Check correct connection of cables.
Engine cannot be shut down	Regulator defective	Check regulator, replace if necessary.
	Starter switch defective	Tighten connections. Replace the switch.
	Engine shut-down solenoid not O.K.	Check the engine solenoid, replace if necessary.

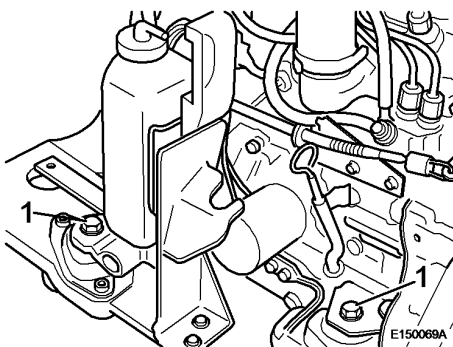
Document Title: <b>Installing the engine</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/6/22</b>
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## Installing the engine

**Op nbr 2101**

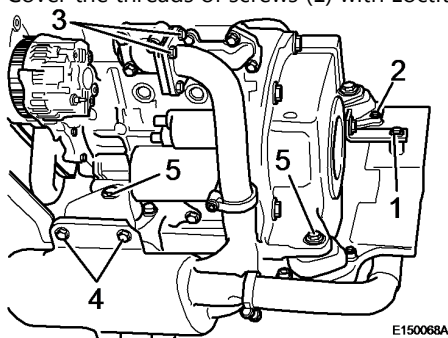
Lifting sling 1 m

Shackle 3/8"



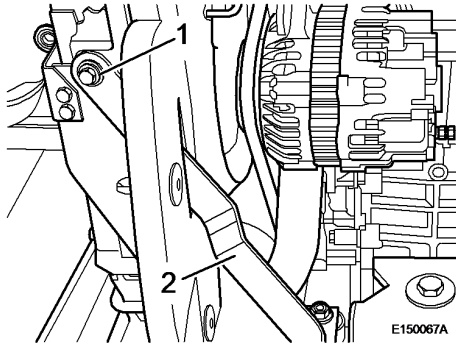
**Figure 1**

1. Attach the lifting tackle to the engine. Weight approx. 125 kg.
2. Place the engine into the engine carrier.
3. Cover the threads of screws (1) with Loctite, turn them into the rear engine suspension and tighten with 105 Nm.



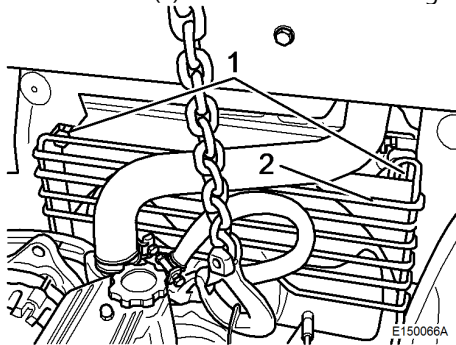
**Figure 2**

4. Cover the threads of screws (5) with Loctite, turn them into the front engine suspension and tighten with 105 Nm.
5. Assemble the exhaust system with a new seal to the exhaust manifold.
6. Turn in screws (1 and 2) and tighten with  $30 \pm 5$  Nm.
7. Fasten the exhaust bracket to the engine carrier and tighten the screws (4 and arrow) with  $60 \pm 10$  Nm.



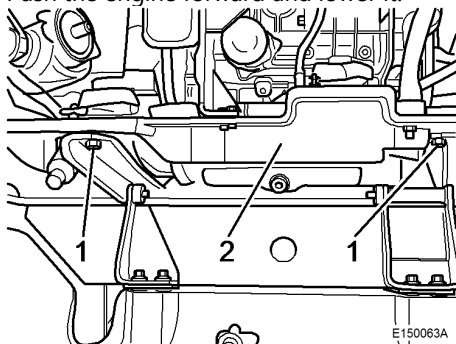
**Figure 3**

8. Turn in screw (1) on both tie rods and tighten with  $30 \pm 5$  Nm.



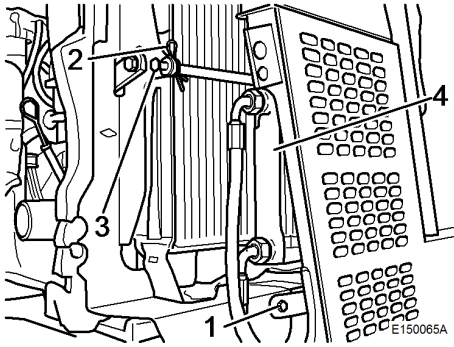
**Figure 4**

9. Attach the radiator grid, turn in screws (1) and tighten with  $30 \pm 5$  Nm.
10. Assemble top and bottom coolant hose with new hose clamps.
11. Close the drain screw and fill in coolant.  
Filling capacity: approx. 5 l
12. Insert the engine with radiator and engine carrier and connect the following components:
  - Generator
  - Starter
13. Push the engine forward and lower it.



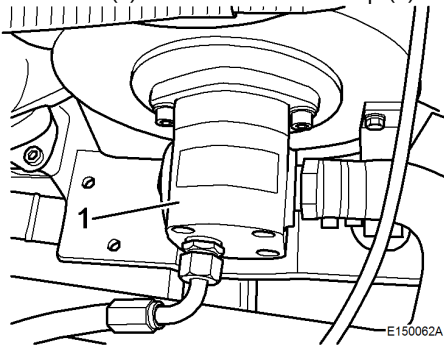
**Figure 5**

14. Turn the fastening screws (1) into the engine carrier (2) and tighten with 105 Nm.
15. Remove the lifting tackle to the engine.



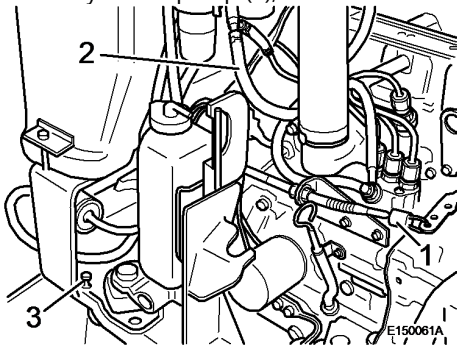
**Figure 6**

16. Install oil cooler (4) and tighten screw (1) with  $12 \pm 2$  Nm.
17. Insert rod (3) and secure with clamp (2).



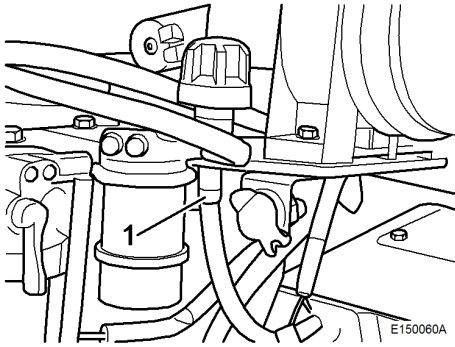
**Figure 7**

18. Install hydraulic pump (1), cover the screws with Loctite, turn them in and tighten with 105 Nm.



**Figure 8**

19. Assemble fuel tank, filter and air filter and tighten the screws (3) with  $30 \pm 5$  Nm.
20. Connect fuel line (2).
21. Fasten throttle control (1) on injection pump and adjust throttle cable.

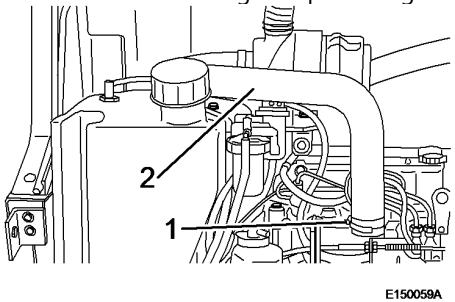


**Figure 9**

22. Connect the breather line (1) to the hydraulic oil tank.
23. Install the engine wiring loom and connect the following components:
  - Air filter contamination indicator
  - Fuel sensor
  - Glow plug
  - Shut-off solenoid
  - Plug for hand lamp
  - Temperature switch
  - Ground strap on engine and engine carrier

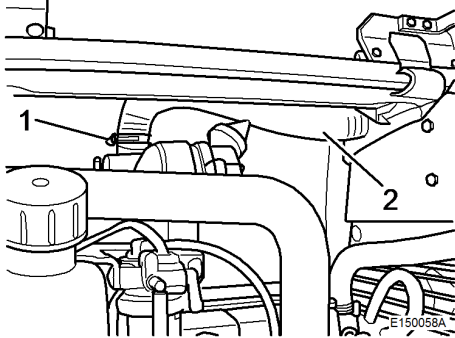
Fasten the cables with cable straps.

24. Assemble the fastening clamps for engine cable set.



**Figure 10**

25. Fasten the air intake hose (2) with a new hose clamp (1) to the air intake pipe.



**Figure 11**

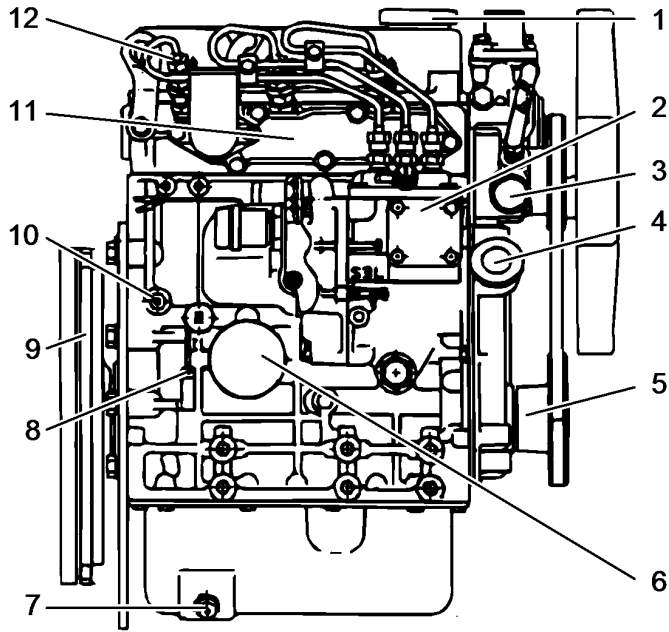
26. Assemble hood with engine hood.
27. Assemble the suction hose with a new hose clamp (1).

28. Bleed the fuel system.
29. Connect the ground cable to the battery.
30. Lift the counterweight up and fasten with the screws.
31. Check engine oil level, top up if necessary
32. Start the engine and make sure that there are no leaks.



Document Title: <b>Operator side</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/6/22</b>
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## Operator side



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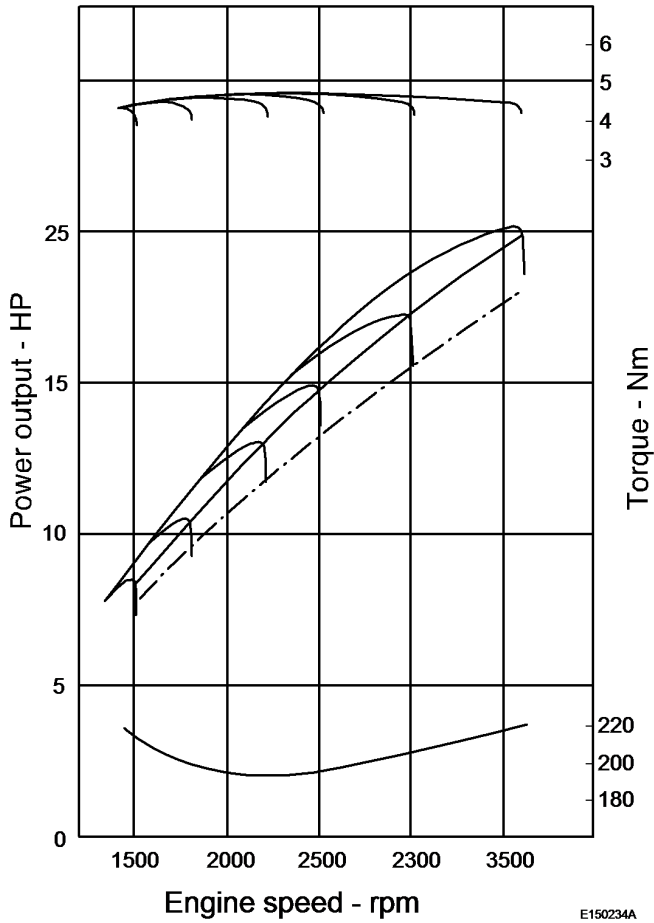
**Figure 1**  
**Engine, side view**

1. Oil filler neck
2. Injection pump
3. Water pump
4. Oil filler neck
5. Crankshaft pulley
6. Oil filter
7. Oil drain plug
8. Oil dipstick
9. Flywheel
10. Coolant drain plug
11. Intake manifold
12. Injection nozzle

Document Title: <b>Performance characteristics (measuring values for one hour with fan)</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/6/22</b>
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**Performance characteristics (measuring values for one hour with fan)**

Engine performance diagram



**Figure 1**

Document Title: <b>Removing the engine</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/6/22</b>
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## Removing the engine

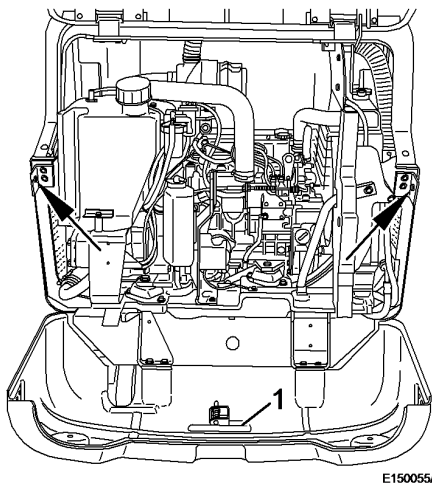
Op nbr 2101

Lifting sling 1 m

Shackle 3/8"

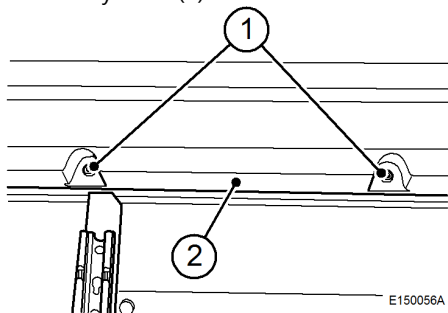
### **WARNING**

**Disconnect and connect the battery only with the ignition switched off. Disconnect the minus pole (green fastening) first. During assembly connect the plus pole (red cable) first.**



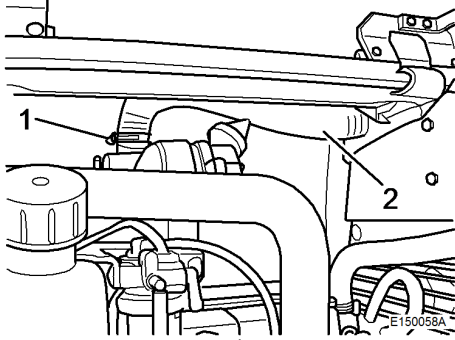
**Figure 1**

1. Disconnect the ground cable from the battery.
2. Unscrew both screws (arrows) on both sides of the counterweight.
3. Pull safety lever (1) and move the counterweight to bottom position.



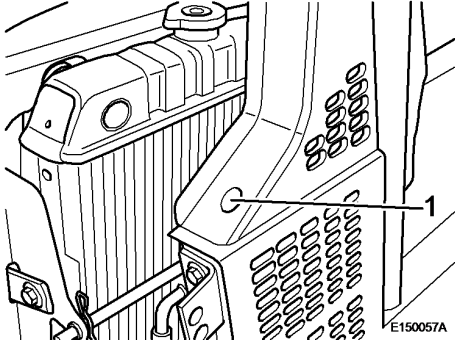
**Figure 2**

4. Unscrew the front socket head cap screws (1) for the hood (2).



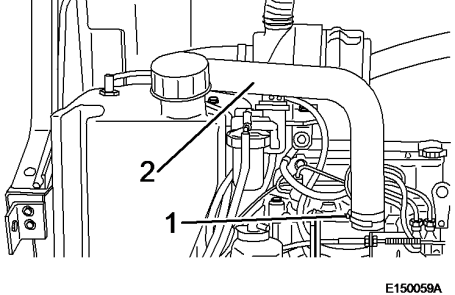
**Figure 3**

5. Loosen hose clamp (1) and place the stop hose (2) to the side.



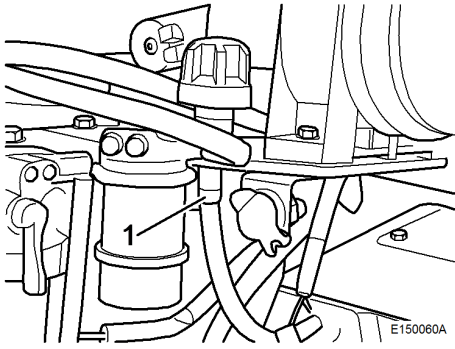
**Figure 4**

6. Unscrew both rear socket head cap screws (1) and take off hood with engine hood.



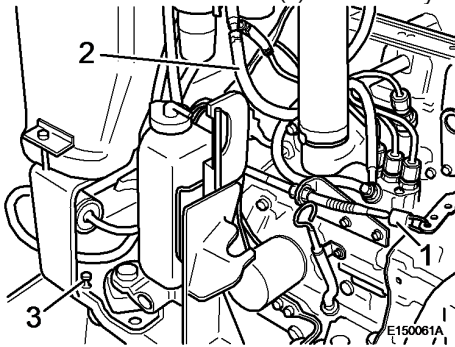
**Figure 5**

7. Loosen hose clamp (1) and pull air intake hose (2) off the air intake pipe.
8. Close openings on the engine with adhesive tape.
9. Disconnect all necessary electrical cables and terminals from the following components:
- Air filter contamination indicator
  - Fuel sensor
  - Glow plug
  - Engine shut-down solenoid
  - Plug for hand lamp
  - Temperature switch
  - Ground strap on engine and engine carrier
10. Remove the fastening clamps for engine cable set.



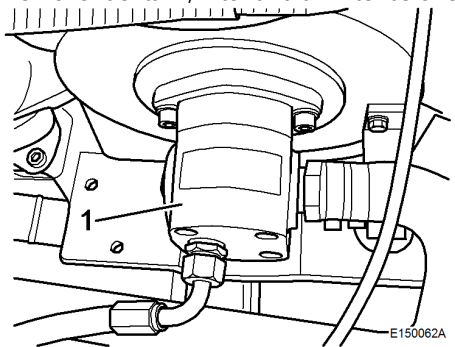
**Figure 6**

11. Remove the breather line (1) from the hydraulic oil tank.



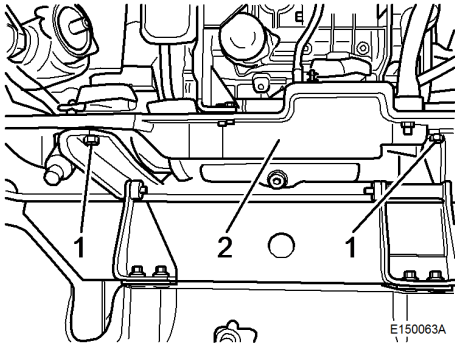
**Figure 7**

12. Unhook throttle cable (1) from the injection pump.
13. Disconnect fuel supply line (2).
14. Unscrew all screws (3) from the fuel tank.
15. Remove fuel tank, filter and air filter as one unit.



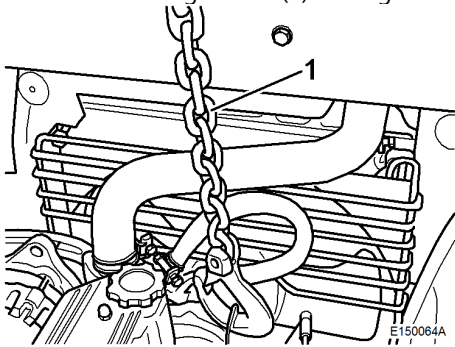
**Figure 8**

16. Disassemble hydraulic pump (1) from engine, lay to the side and fasten it safely.



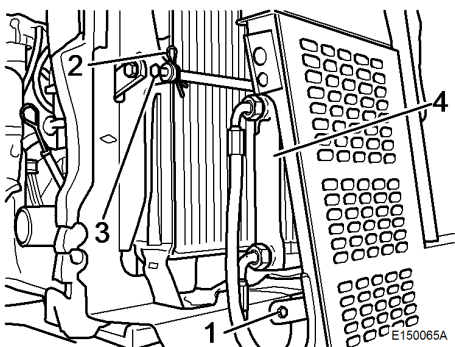
**Figure 9**

17. Unscrew fastening screws (1) for engine carrier (2).



**Figure 10**

18. Attach lifting tackle (1) to the engine.
19. Lift the engine up and pull it out towards the rear.
20. Disconnect all necessary electrical cables from the following components:
  - Starter
  - Generator



**Figure 11**

21. Unscrew screw (1).
22. Unhook calmp (2) and push out rod (3).
23. Lay oil cooler (4) to the side and fasten it.
24. Lift out engine with radiator and engine carrier.

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