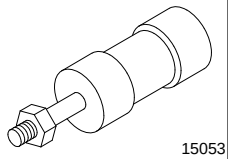
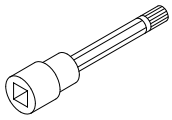
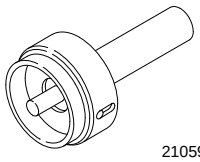
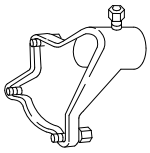
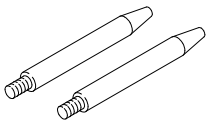
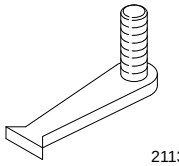
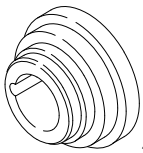
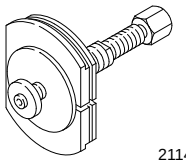
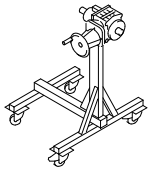
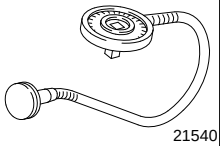
Engine – Dismantle and Assemble (21 134 8)

Special Tools

 15053	**15–053** Slide hammer
 21002	**21–002** Splined head socket, cylinder head bolts
 21059C	**21–059C** Installer for radial seal
 21064	**21–064** Mounting bracket
 21128	**21–128** Cylinder head guide studs
 21135	**21–135** Flywheel immobilising tool
 21137	**21–137** Oil seal installer/aligner
 21147	**21–147** Vibration damper remover
	**21–187** Mounting stand with geared drive
 21540	**21–540** Angle gauge

Proprietary Tools

Oil filter wrench
Universal strap wrench
Magnetic fixture
Dial indicator
Piston ring compressor
Angled torx key T30
4,5 mm Allen key

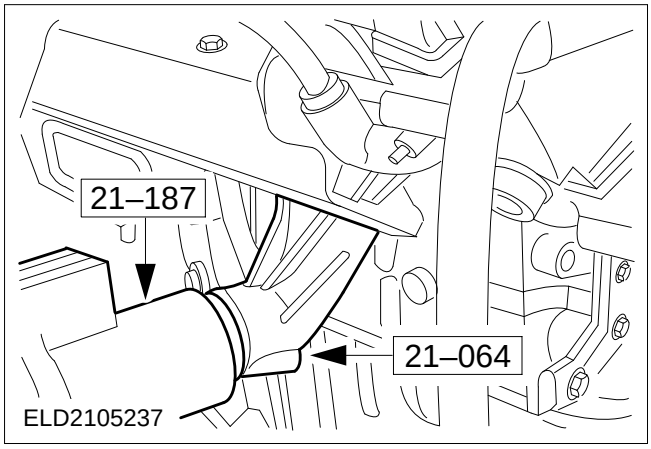
Materials

Plastigage	Obtainable through: Replacement Services Limited, 16 Euston Street, Freemans Industrial Estate, Leicester LE2 7ST
Hylosil sealer 502	WSK-M4G320-A
Sealer – Loctite 518	ESK-M4G269

Dismantle

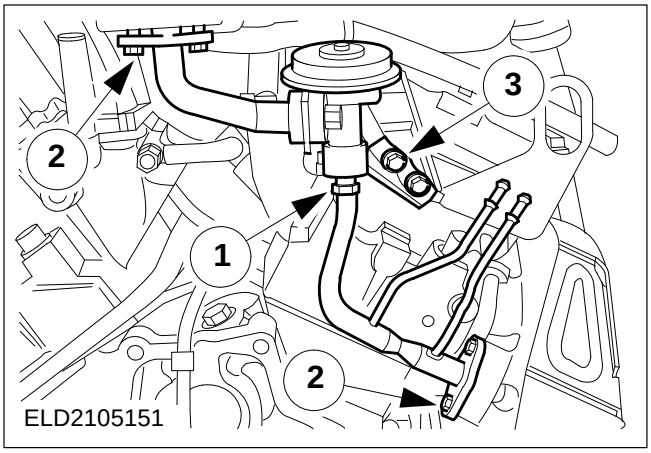
1. General instruction.

All parts should be set aside in order.



2. Attach the engine to the assembly stand.

- Drain off the engine oil.
- Screw in the oil drain plug and tighten it to 24 Nm.

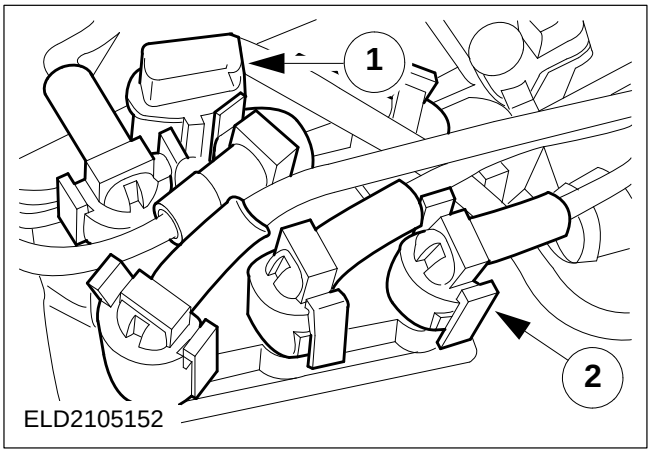


3. Detach the exhaust gas recirculation (EGR) valve.

1 Slacken the nut.

2 Detach the EGR pipes.

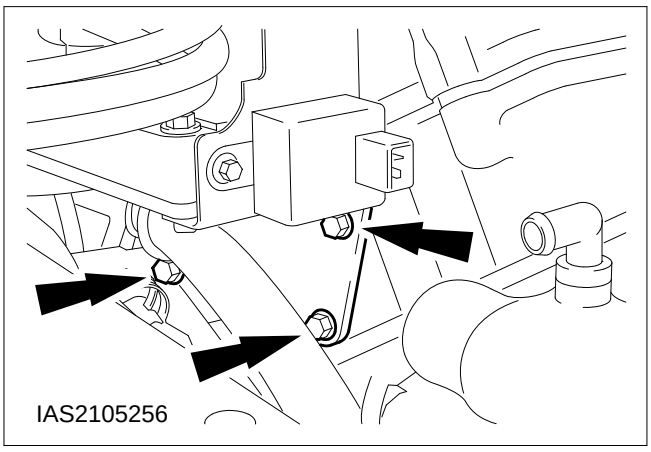
3 Remove the exhaust gas recirculation (EGR) valve.



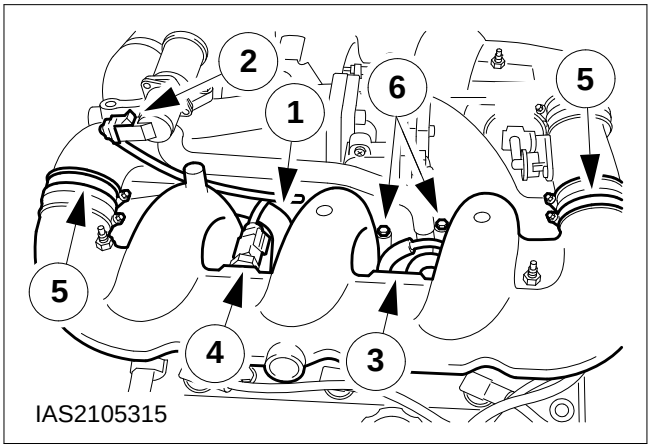
4. Disconnect the plug from the ignition coil.

1 Ignition coil plug.

2 HT lead.



5. Detach the ignition coil bracket.



6. Remove the right-hand inlet manifold.

1 Disconnect the positive crankcase ventilation (PCV) hose and the vacuum hose.

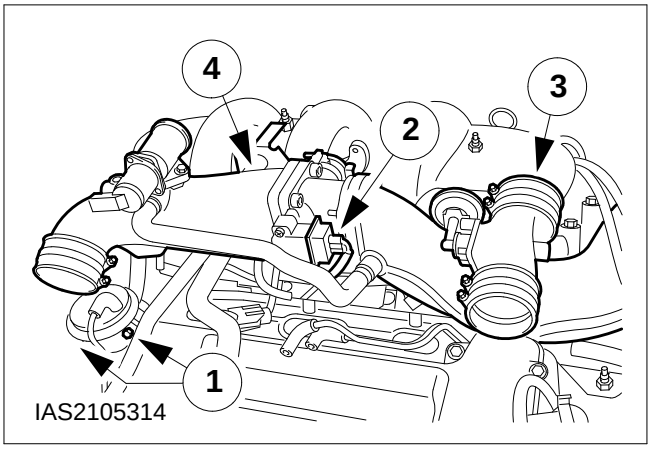
2 Disconnect the plug from the idle air control (IAC) valve.

3 Disconnect the two vacuum hoses.

4 Disconnect the multiplug from the intake air temperature sensor (IAT sensor).

5 Remove the connecting hoses.

6 Remove the bolts and pull the inlet manifold off the intake air plenum chamber (six bolts).



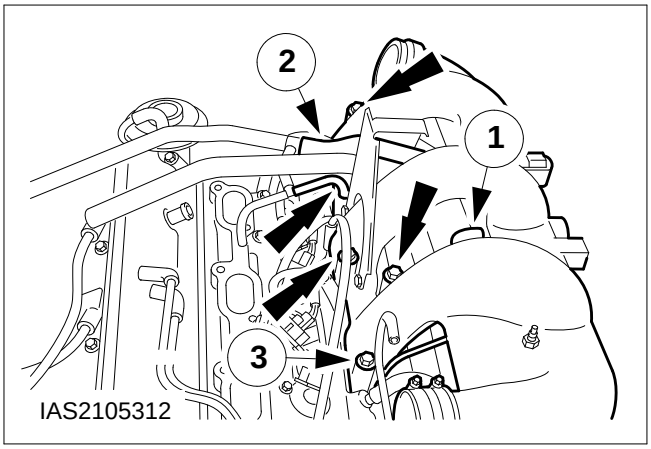
7. Remove the air intake plenum chamber.

1 Remove the EGR valve from the air intake plenum chamber (two bolts):

2 Disconnect the plug from the throttle position (TP) sensor.

3 Remove the variable resonance induction system (VRIS).

4 Detach the intake air plenum chamber from the left-hand inlet manifold and lift it out.

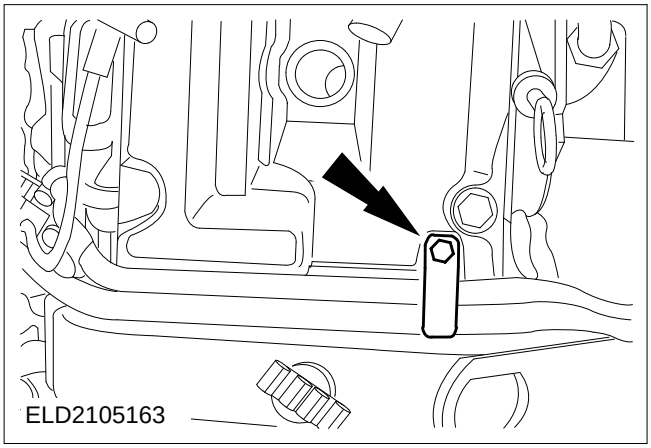


8. Remove the left-hand inlet manifold.

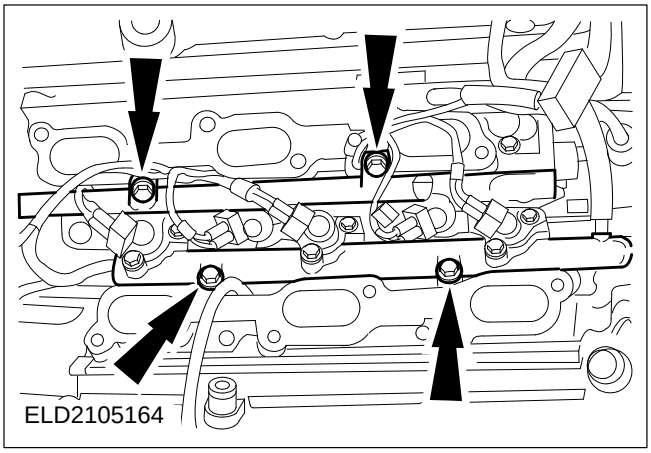
1 Disconnect the vacuum hose.

2 Disconnect the PCV valve from the cylinder head cover.

3 Remove the six bolts.

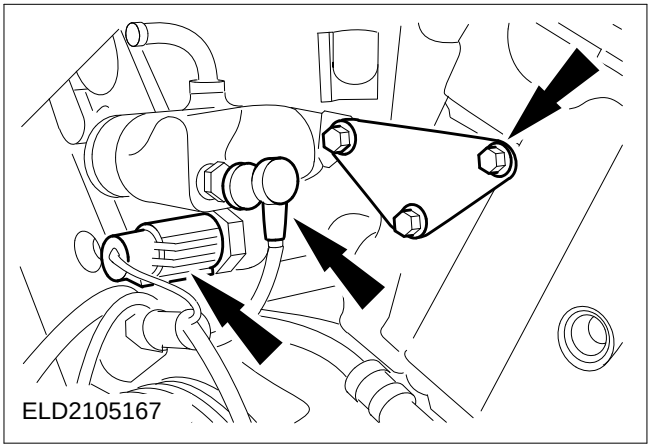


9. Detach the PCV bracket.



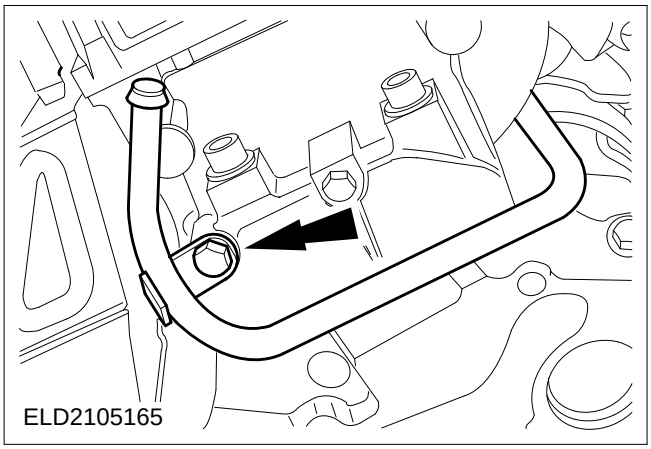
10. Remove the fuel rails.

Disconnect the six fuel injection plugs.

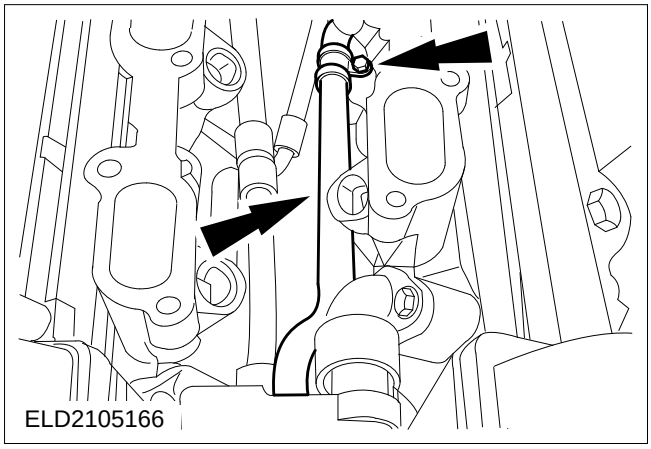


11. Disconnect the plugs and detach the thermostat housing bracket.

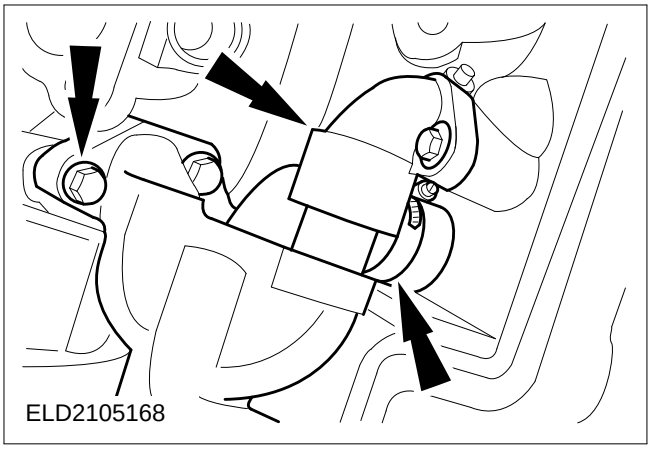
- Engine coolant temperature (ECT) sensor plug.
- Temperature gauge sender unit plug.
- Thermostat housing bracket.



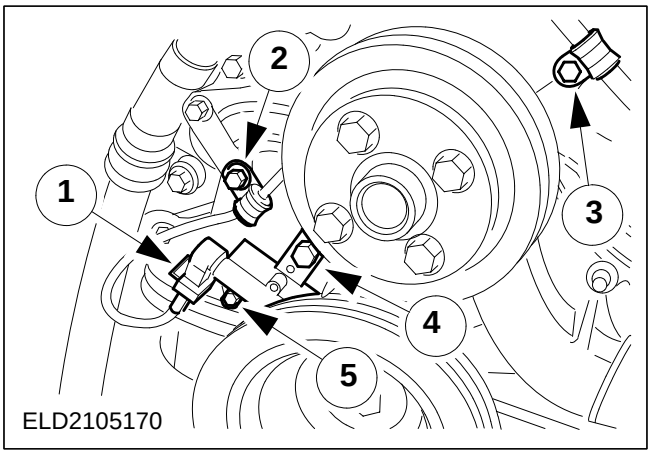
12. Remove the coolant pipe.


ELD2105166

13. Remove the coolant pipe (continued).


ELD2105168

14. Detach the connector, the coolant hose and the thermostat housing (three bolts).



ELD2105170

15. Remove the crankshaft position (CKP) sensor and the clamps.

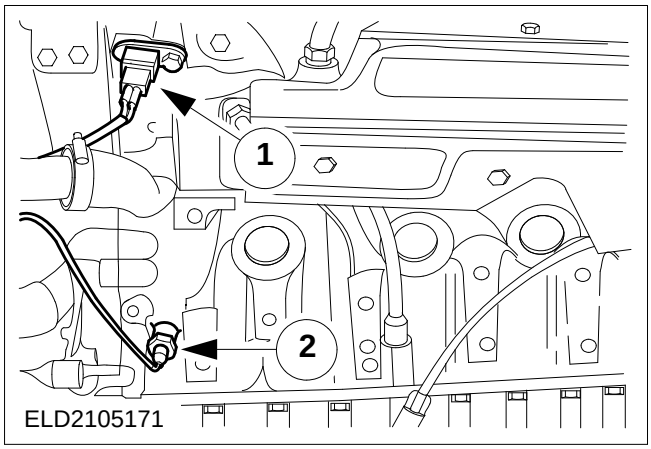
1 Crankshaft position (CKP) sensor.

2 CKP sensor wiring clamp

3 Camshaft position (CMP) sensor wiring clamp

4 CKP sensor bracket

5 CKP sensor.



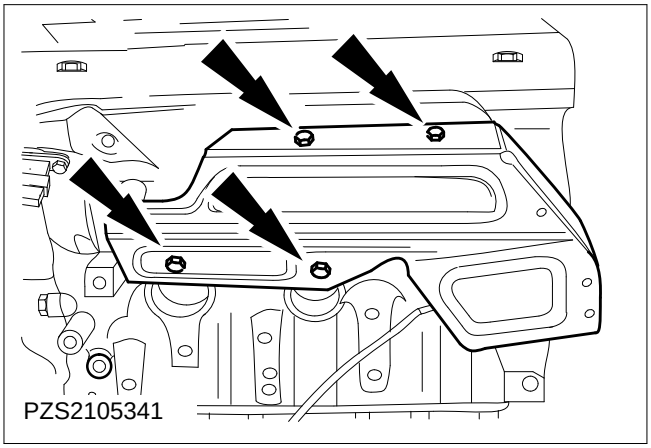
ELD2105171

16. Disconnect the plug from the CMP sensor and remove the oil pressure switch.

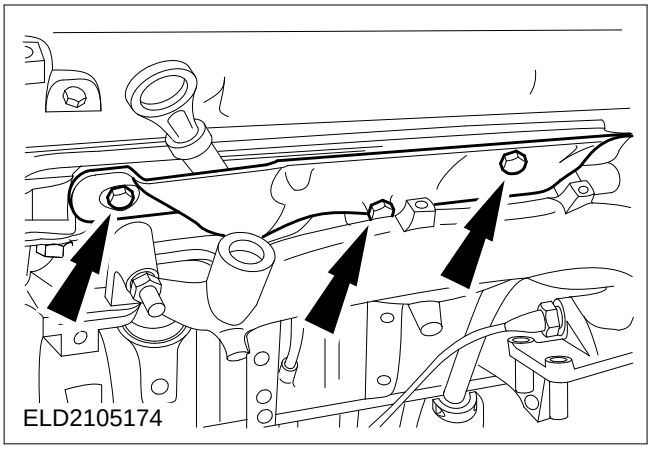
1 CMP sensor plug

2 Oil pressure switch.

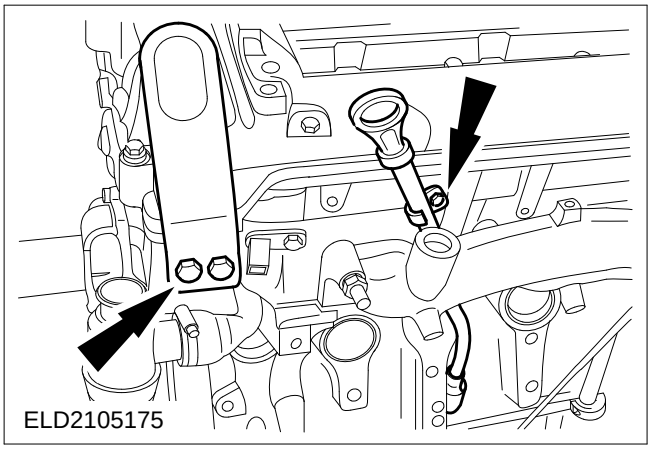
Remove the wiring loom.



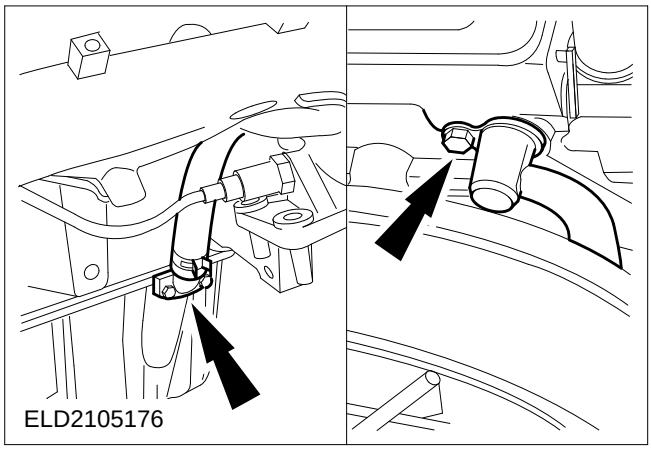
17. Remove the exhaust manifold heat shields (left-hand side shown).



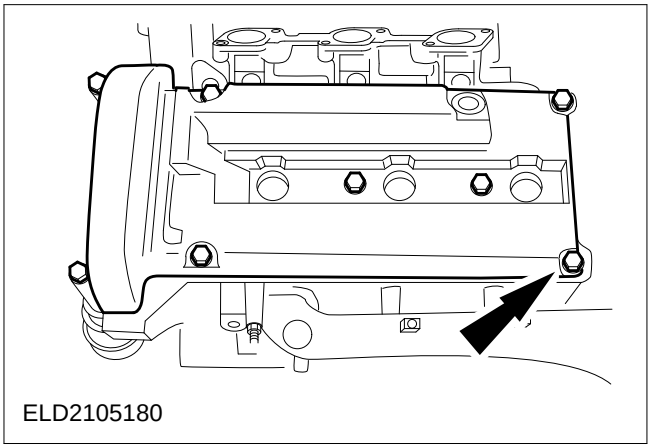
18. Remove the cylinder head heat shields (left-hand side shown).



19. Pull out the dipstick tube and detach the lifting eye.

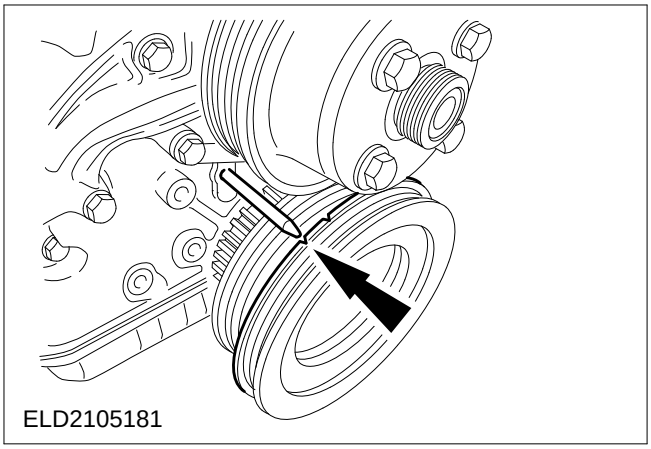


20. Remove the PCV connector (left-hand side shown).



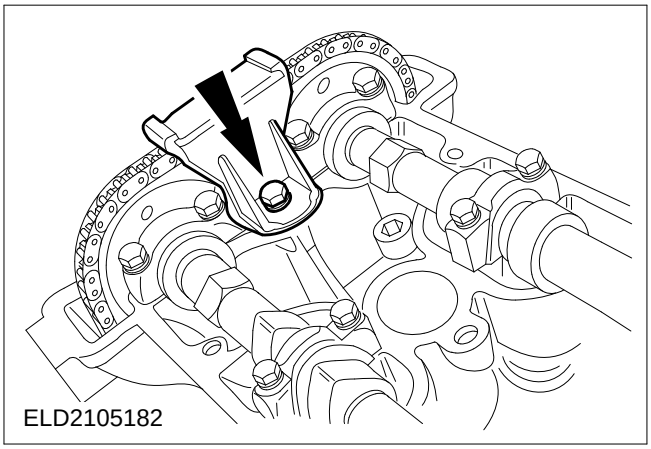
ELD2105180

21. Detach the two cylinder head covers (left-hand side shown).



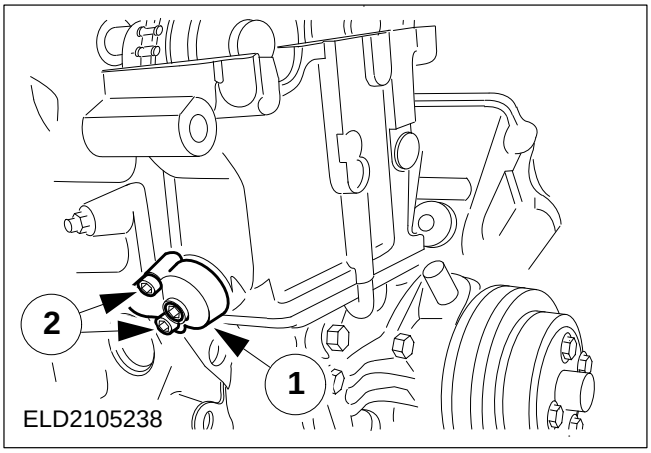
ELD2105181

22. Set the engine to TDC.



ELD2105182

23. Remove the upper chain guide (left-hand side shown).



NOTE: The chain tensioner is locked once there is an audible click and when it has reached its stop.

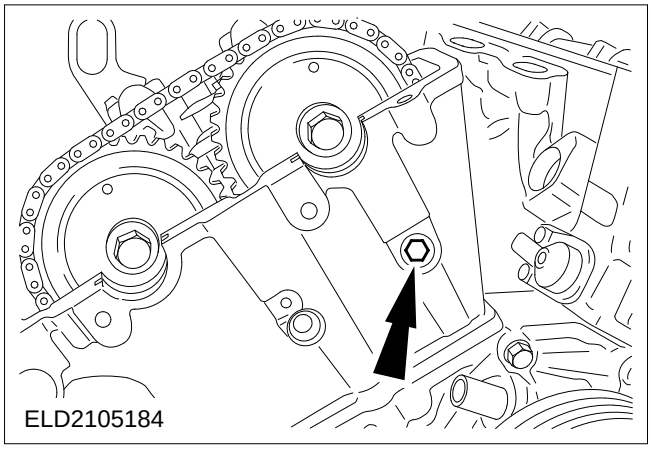
24. Remove the right and left-hand chain tensioners.

1 Remove the chain tensioner blanking plug (4,5 mm Allen key).

NOTE: Use the TORX T30 angled socket.

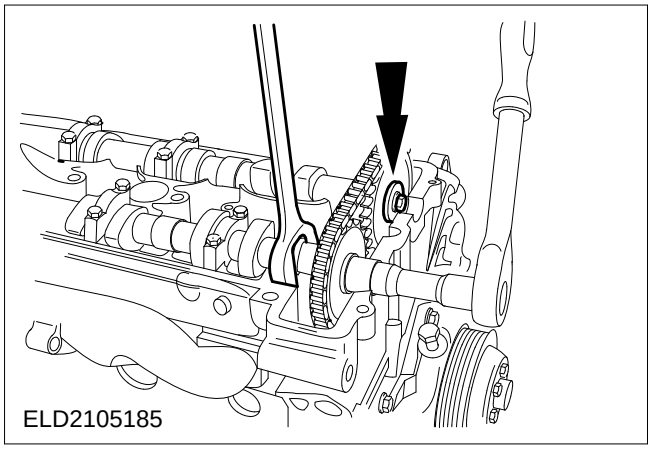
- Lock the chain tensioner by rotating it clockwise.

2 Unscrew the bolts.



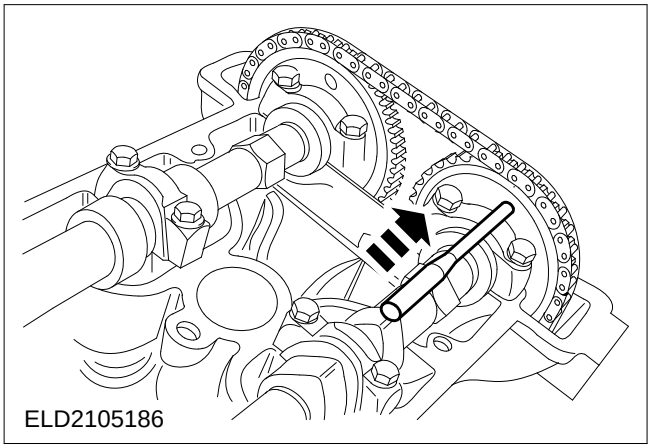
25. Remove the chain guide bolt.

Prise out the blanking plug.



NOTE: Undo the camshaft sprocket bolts ten turns.

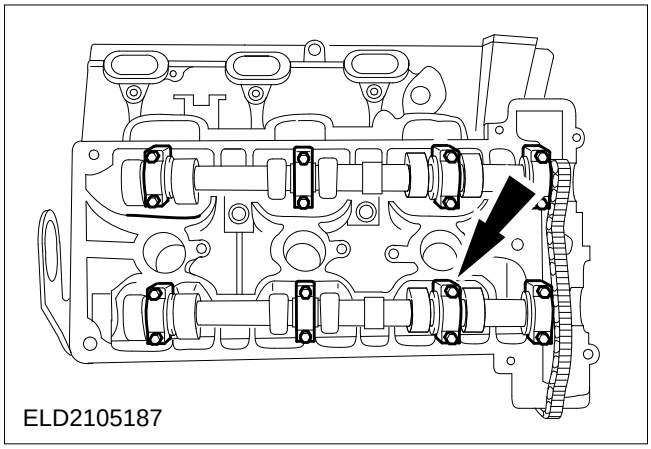
26. Remove the camshaft sprockets.


ELD2105186

NOTE: Hold the timing chain to prevent it falling in.

27. Remove the camshaft sprockets (continued).

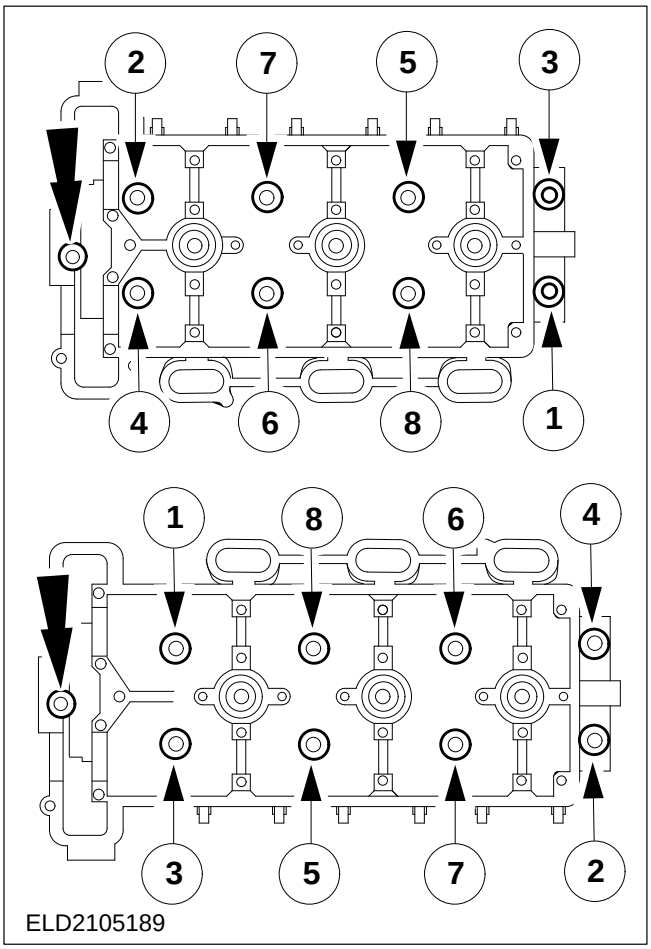
- Lightly tap on the drive plates to loosen them from the camshaft sprockets.
- Remove the camshaft sprocket bolts.
- Remove the camshaft sprockets, drive plates and thrust washers and lay them aside in order.


ELD2105187

NOTE: Loosening sequence: working diagonally from the outside inwards.

NOTE: Remove the camshaft bearing caps and the camshafts and lay them aside in order.

28. Remove the camshaft bearing caps and take out the camshafts.

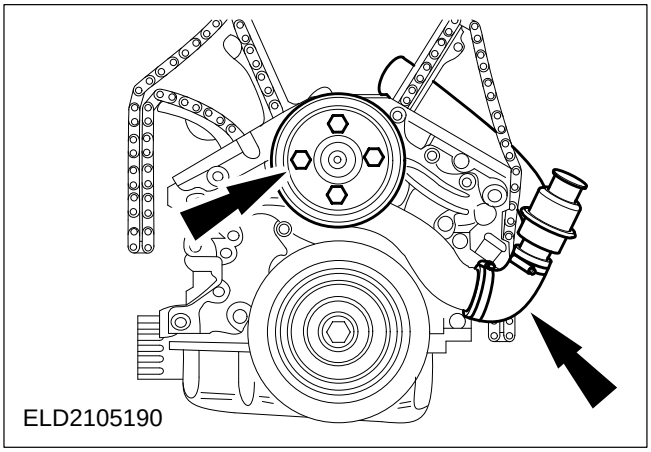


ELD2105189

NOTE: Bolt-slackening sequence.

29. Remove the cylinder heads.

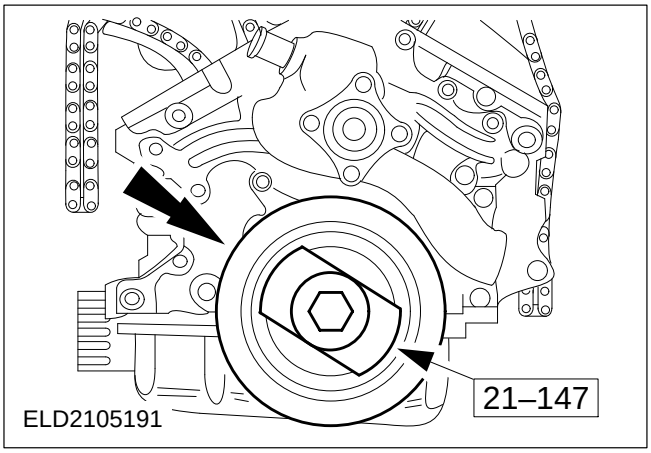
- Remove the cylinder head bolts with special tool 21–002.
- Remove the bolt from the timing chain housing.
- Remove the cylinder heads and the cylinder head gaskets.



30. Detach the coolant pump pulley.

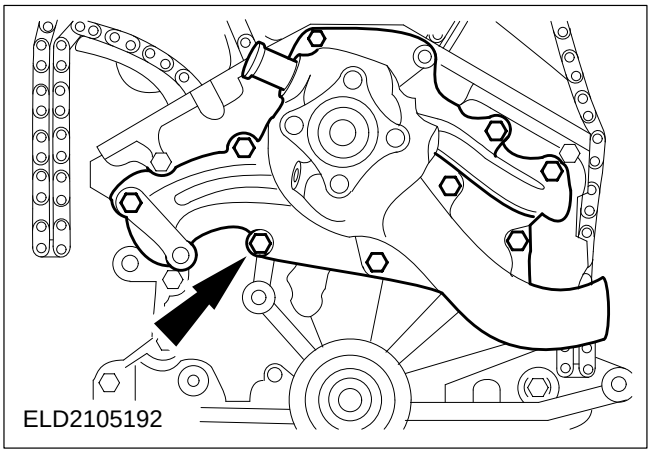
Use a universal strap wrench to stop the coolant pump pulley from turning.

31. Detach the coolant hose.

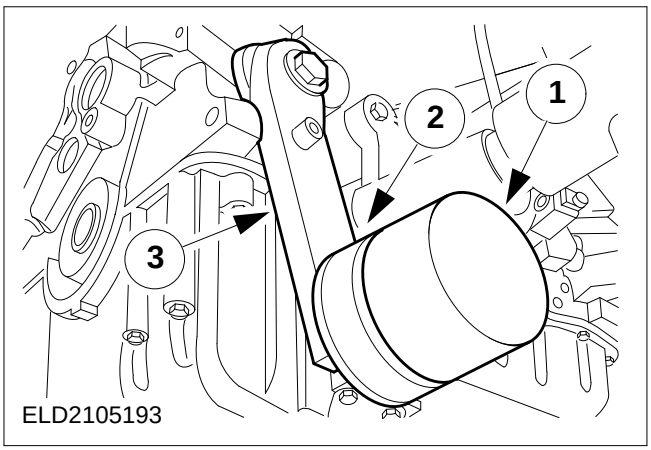


32. Remove the crankshaft vibration damper.

- Immobilise the flywheel with locking tool 21–135.
- Unscrew the bolt approximately 20 mm.
- Pull off the crankshaft vibration damper.
- Remove the bolt.
- Remove the immobilising tool.



33. Detach the coolant pump.

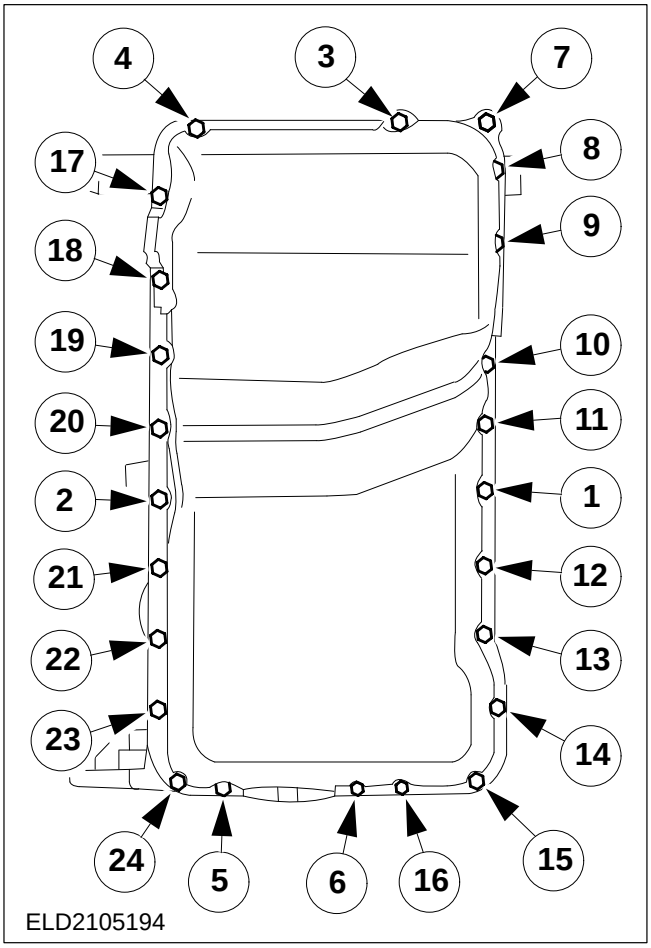


34. Remove the oil filter connector.

1 Oil filter

2 Oil cooler

3 Oil filter connector

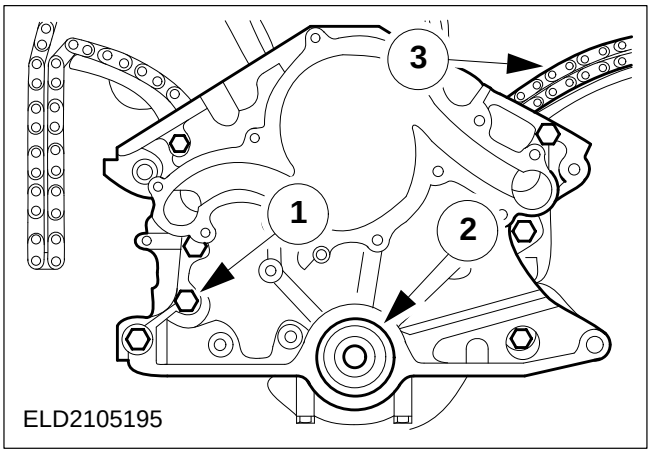


ELD2105194

NOTE: Bolt-slackening sequence.

NOTE: Remove the sump downwards so that abraded particles and sludge cannot fall into the engine.

35. Remove the sump.



ELD2105195

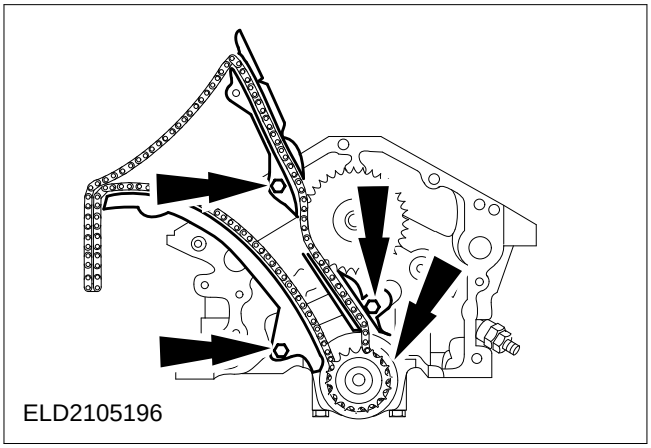
NOTE: The left-hand chain guide attached to the timing chain housing.

36. Detach the timing chain housing (eight bolts).

1 Seven bolts at the front, one at the top of the back.

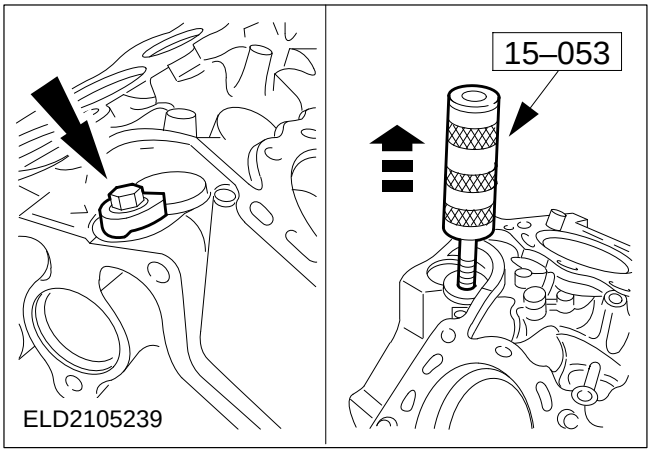
2 Remove the crankshaft oil seal with remover 21–051.

3 Lift the left-hand timing chain away from the chain guides and remove the timing chain housing.

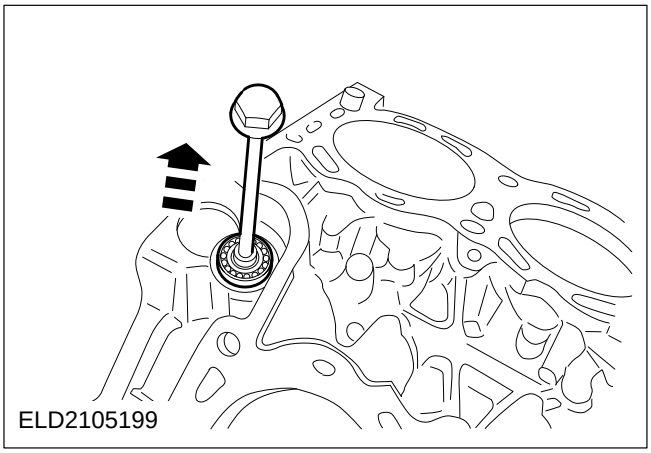


37. Remove the timing chain.

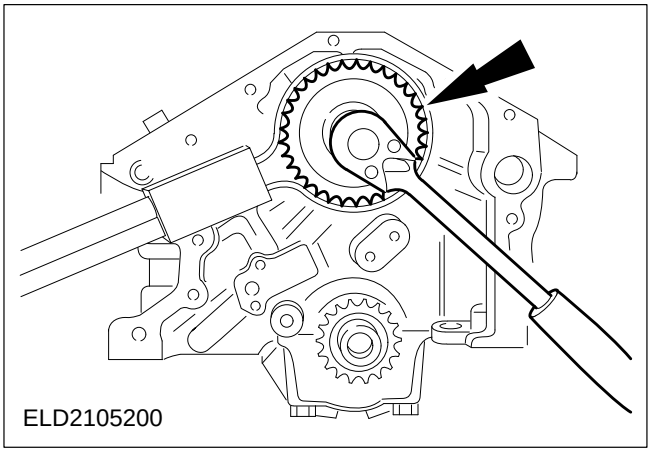
- Remove the timing chain sprocket together with the timing chain out towards the front.
- Take the crankshaft Woodruff key out of the groove.
- Remove the chain guides.



38. Remove the pressure pad from the oil pump drive bearing housing and draw out the oil pump drive bearing housing.



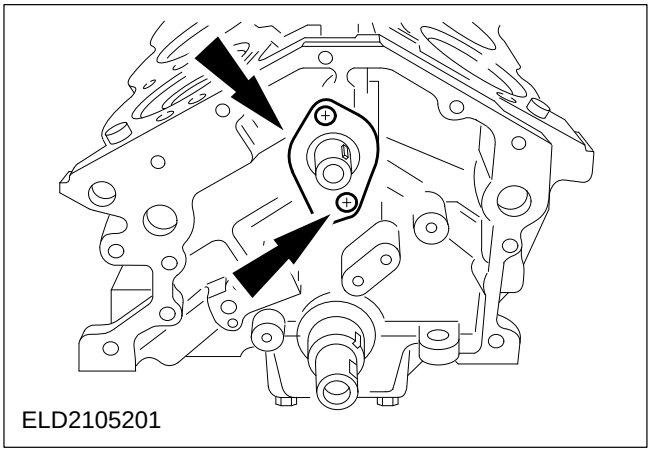
39. Remove the oil pump driving sprocket using an M6 bolt.



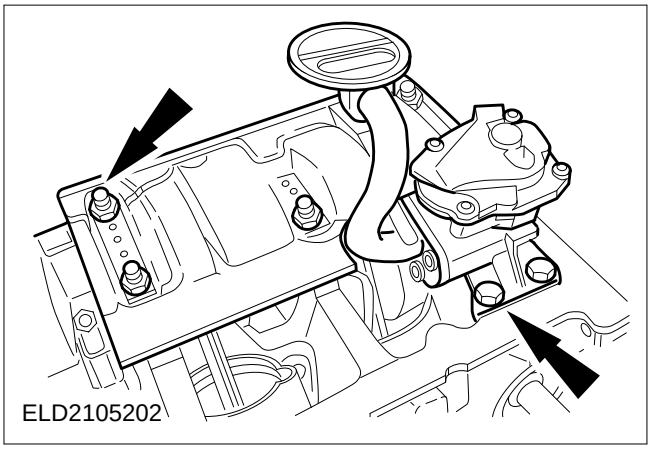
NOTE: Left-hand thread.

40. Detach the intermediate shaft timing sprocket.

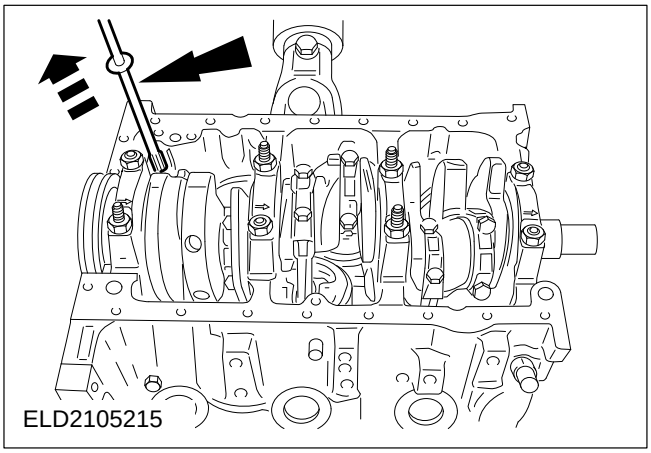
- Use a universal strap wrench to stop the timing sprocket from turning.
- Remove the spacer washer.


ELD2105201

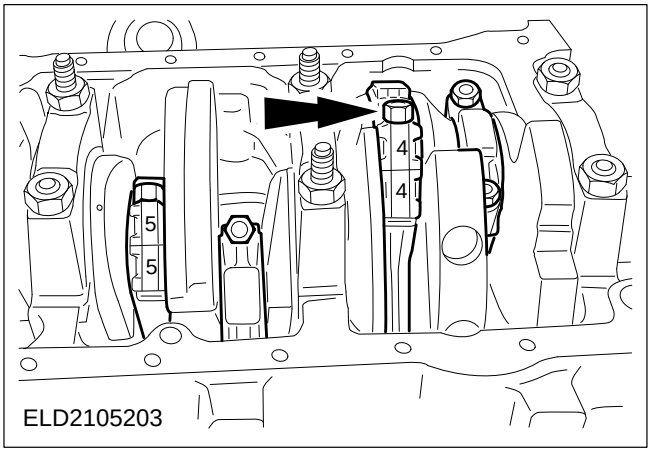
41. Remove the bearing plate and withdraw the intermediate shaft.


ELD2105202

42. Detach the oil baffle plate and the oil pump.


ELD2105215

43. Withdraw the driving shaft from the oil pump.

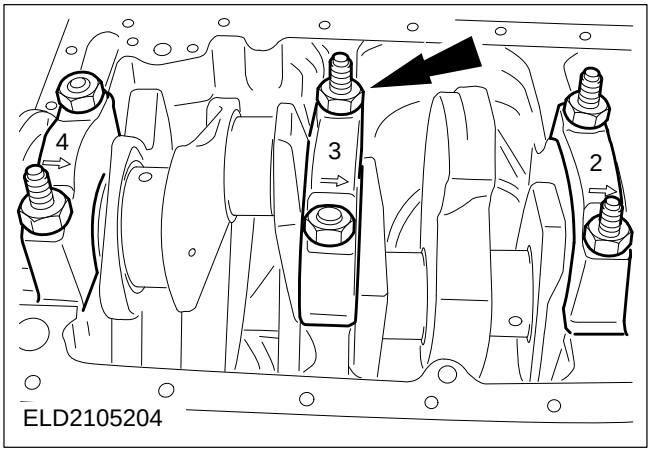


ELD2105203

CAUTION: Do not damage the cylinder bores.

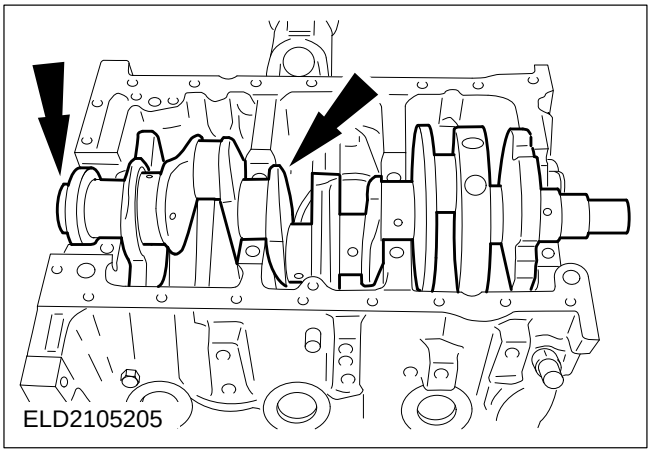
44. Remove the pistons.

- Remove the carbon from the upper edge of the cylinder bores.
- Detach the big-end bearing caps.
- Remove the pistons and connecting rods.



45. Remove the crankshaft.

Detach the main bearing caps.



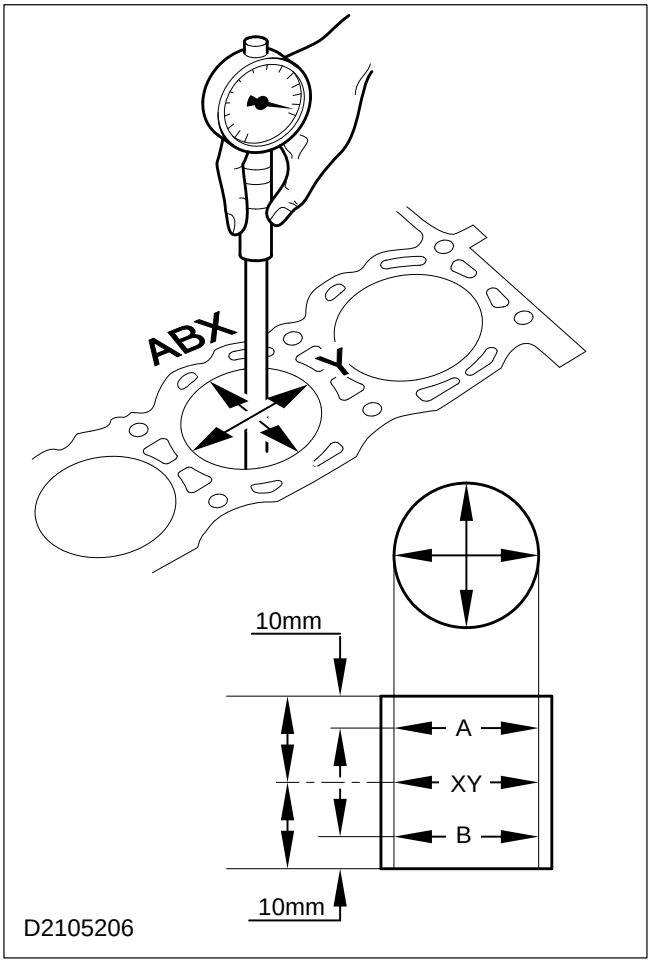
46. Take out the crankshaft.

Remove the radial oil seal.

Assemble

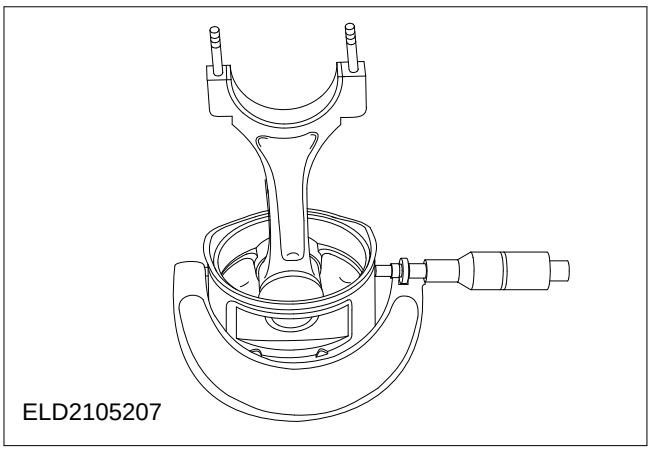
47. Preparatory measures.

All mating faces and reusable parts should be thoroughly cleaned and checked for damage.



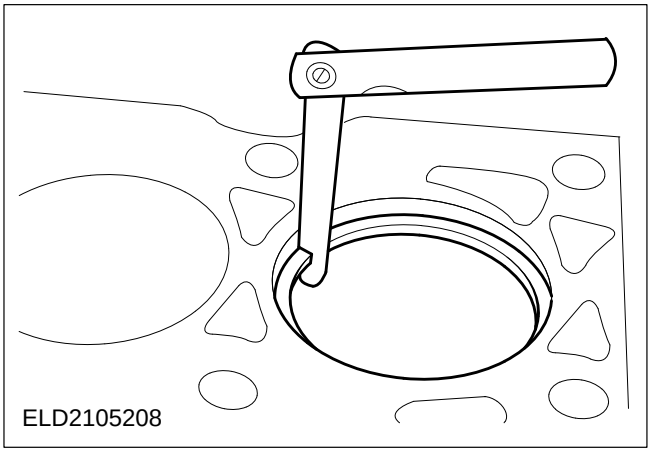
Measure the cylinder bores

48. Measure the cylinder bores.



Measure the pistons and piston rings.

49. Measure the pistons.

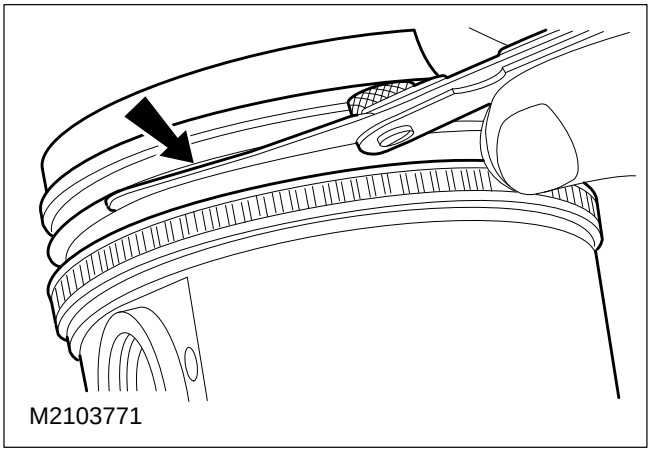


CAUTION: Do not mix up the piston rings. They should be refitted in the same positions.

NOTE: Carry out the measurement at the top end of the run-in cylinder bore.

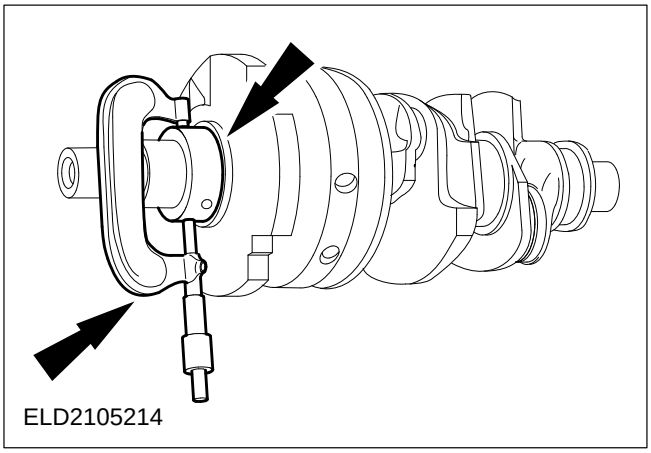
50. Measure the piston ring gaps.

- If necessary renew the piston rings.
- See technical data for piston ring gaps.


M2103771

NOTE: Measure the clearance with the ring protruding from the groove.

51. Measure the piston ring clearance.


ELD2105214

52. Measure the diameter of the main and big-end bearing journals.

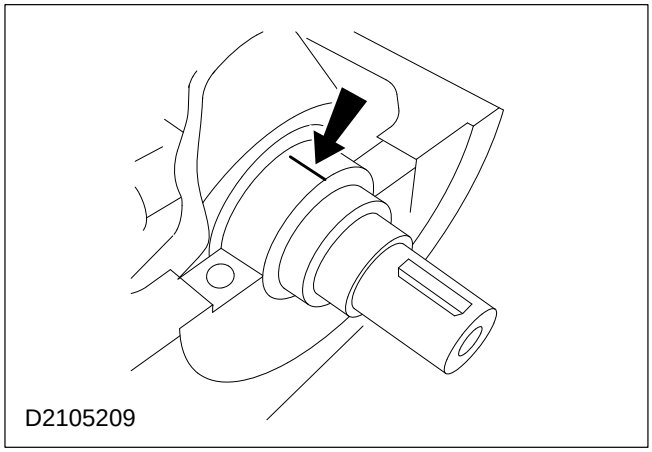
- In each case, repeat the measurement 90° around the circumference.
- Rework or renew the crankshaft if necessary.

Measure the main bearing clearance.

53. General notes.

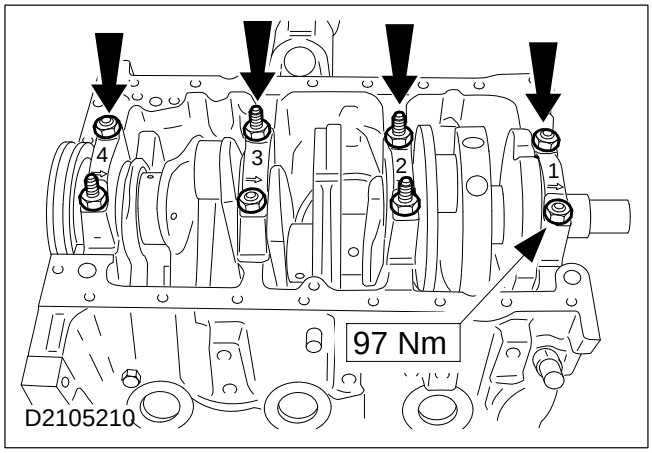
NOTE: Measure each bearing individually with a length of Plastigage thread.

- Fit the main bearing cap of the bearing which is to be measured and tighten it to the specified torque.
- The bearing shells/journals and the crankshaft must be clean and free of oil.
- The measuring point should be near the respective dead centre position.
- The crankshaft must not be turned during the measuring operation.
- Measure the bearing clearances one after the other in numerical order.


D2105209

54. Measure the crankshaft main bearing clearance.

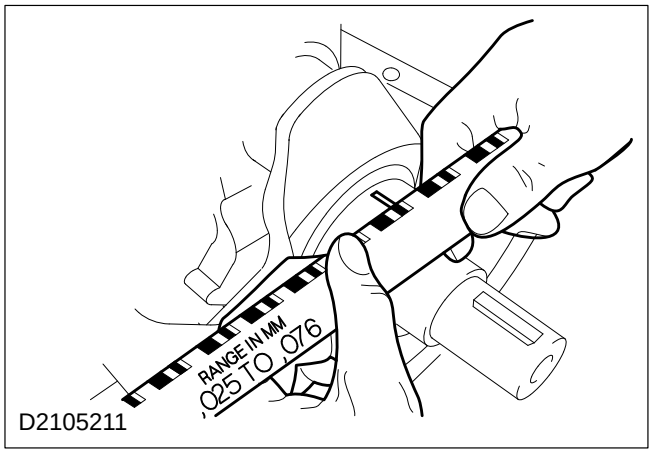
Lay a length of Plastigage thread on the bearing journal across the bearing.



D2105210

NOTE: The main bearing cap numbering starts at the timing chain end, to which the arrows also point.

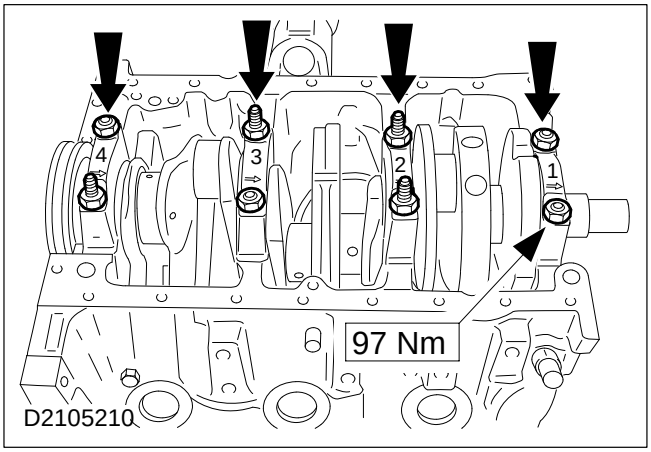
- Fit the main bearing caps with the associated bearing shells and tighten them.
- Remove the main bearing caps.



D2105211

55. Compare the Plastigage thread with the Plastigage scale.

If the reading does not correspond to the specified bearing clearance, renew the bearing shells as necessary and repeat the operation from step 54.

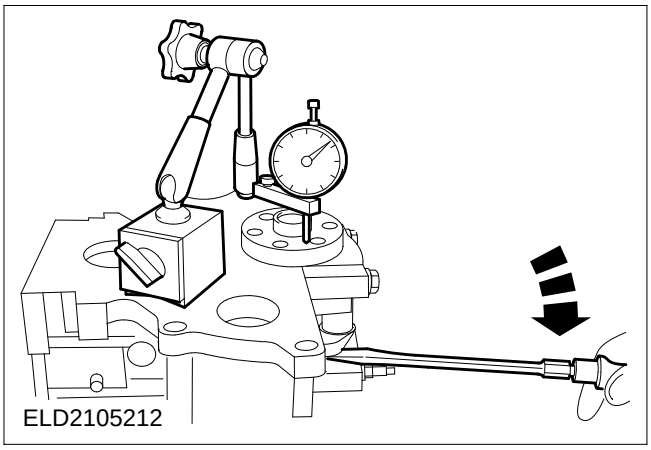


NOTE: Installation position of the studs.

NOTE: The main bearing cap numbering starts at the timing chain end, to which the arrows also point.

56. Install the crankshaft.

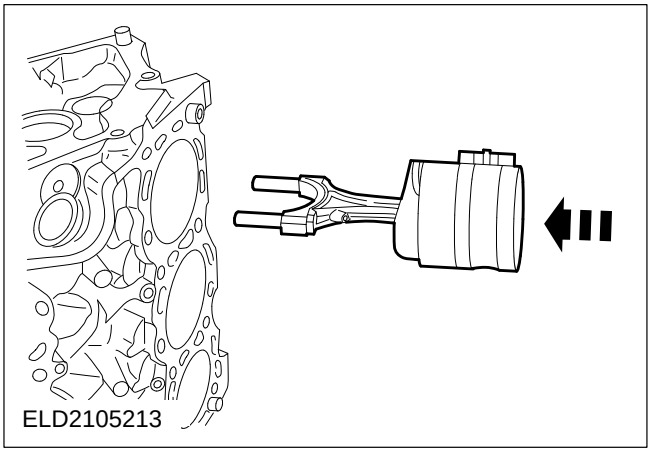
- Coat the crankshaft main bearing journals, bearing shells, and all bolt threads and bolt contact faces with engine oil.
- Fit the crankshaft.
- Fit the rear main bearing cap using sealer (ESK-M4G269).
- Fit the main bearing caps with the associated bearing shells.
- Tighten the bolts.



57. Check the crankshaft end float.

- Set up a dial indicator.
- Check the end float by lifting the crankshaft.

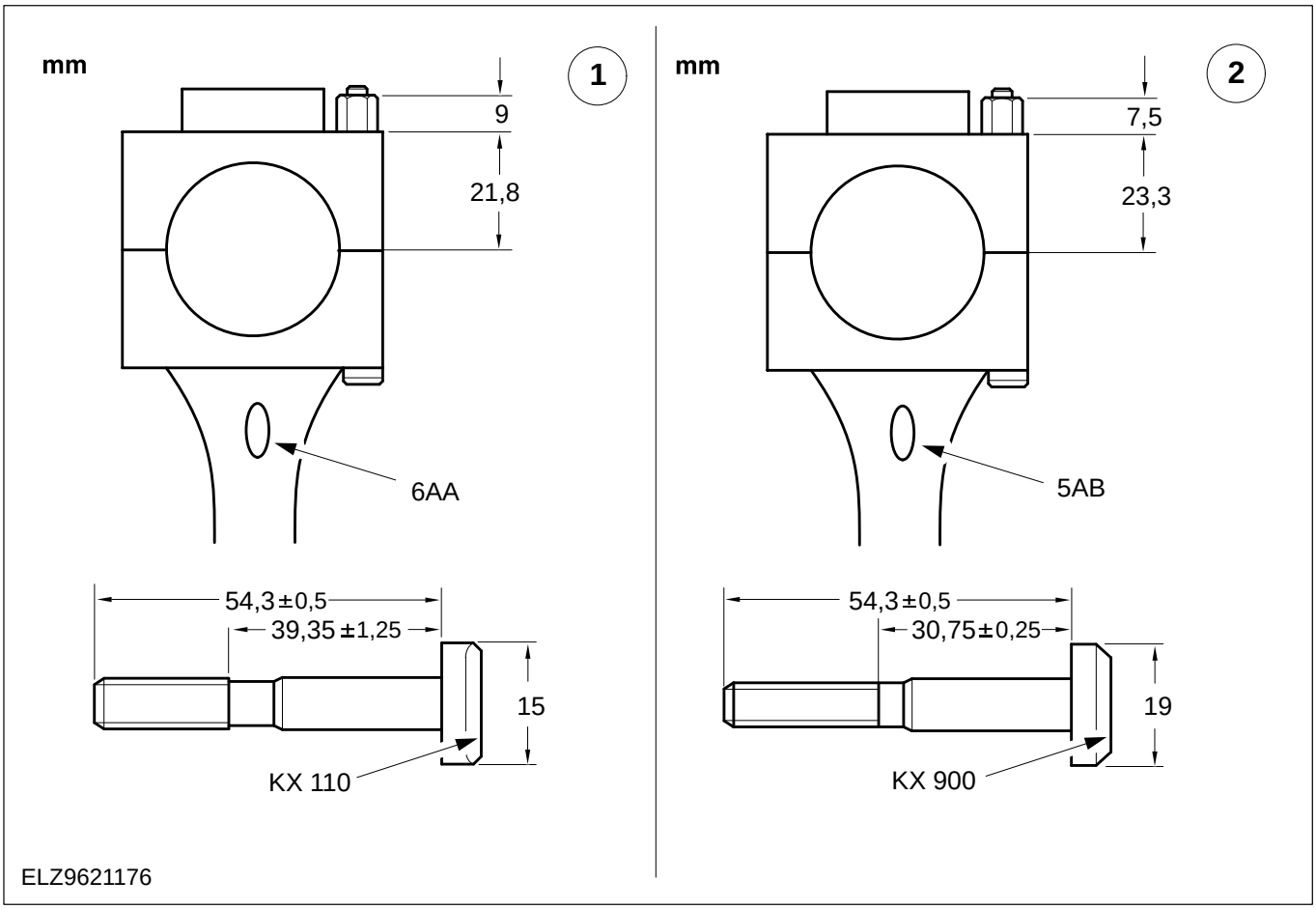
58. If necessary, correct the end float with thrust half rings on main bearing no. 3.



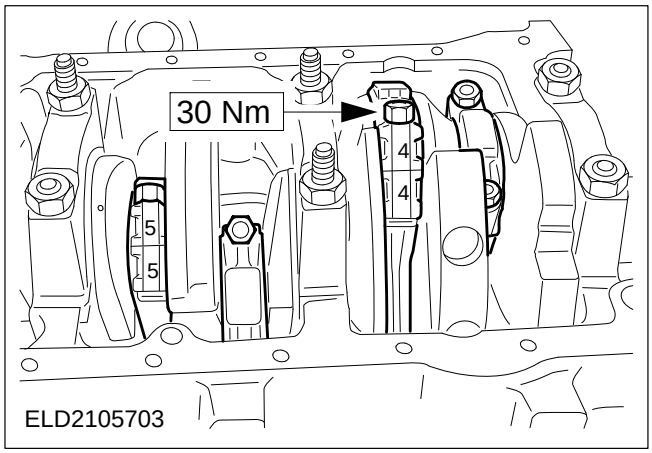
NOTE: The numbering on the connecting rods starts at the timing chain end. The arrow on the piston crown points towards the timing chain end.

59. Fit the pistons.

- Lubricate the pistons and cylinder bores with engine oil.
- Arrange the piston ring gaps at 120˚ intervals.
- Compress the piston rings with a proprietary piston ring compressor.
- Fit the associated bearing shells clean and oiled into the connecting rods and the big-end bearing caps.
- Press the pistons into the cylinders using the handle of a hammer, guiding the connecting rods on to the big-end bearing journals. The appropriate big-end bearing journal must be at BDC.



60. Identifying used conrod bolts and connecting rods.



Measure the big-end bearing clearance.

Only for engines with conrods and conrod bolts 6AA or KX110.

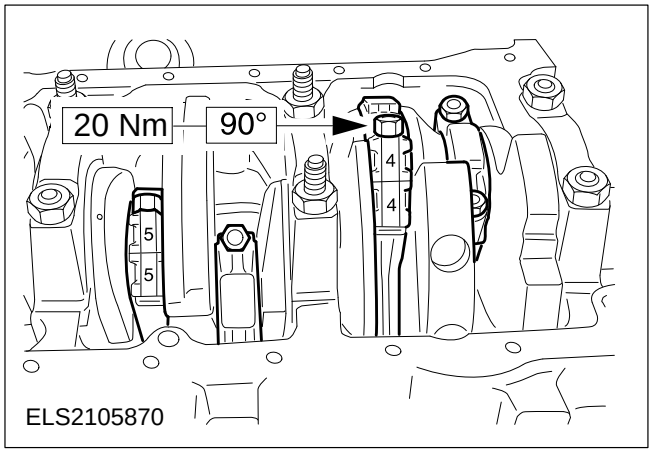
61. Measure the big-end bearing clearance.

Carry out the same procedure as for measuring the main bearing clearance.

NOTE: The connecting rods and their bearing caps have the same numbers.

62. Fit the big-end bearing caps.

- Lubricate the bearing shells, big-end bearing journals and the bolt threads and bolt contact faces with engine oil.
- Fit the associated big-end bearing caps with the bearing shells and secure them.



Only for engines with conrods and conrod bolts 5AB or KX900.

NOTE: Use the old bolts to measure the bearing clearance.

63. Measure the big-end bearing clearance.

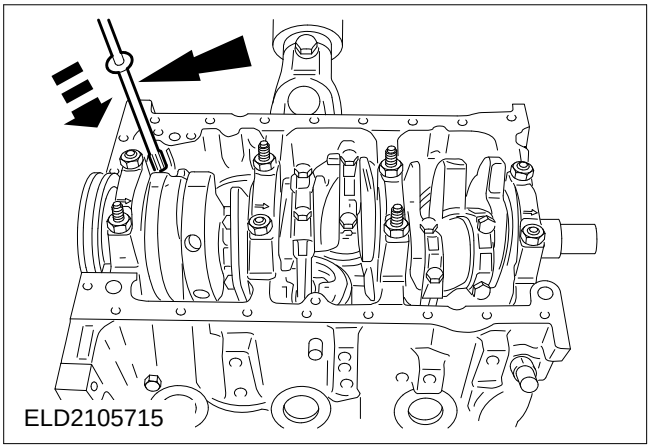
Carry out the same procedure as for measuring the main bearing clearance.

NOTE: The connecting rods and their bearing caps have the same numbers.

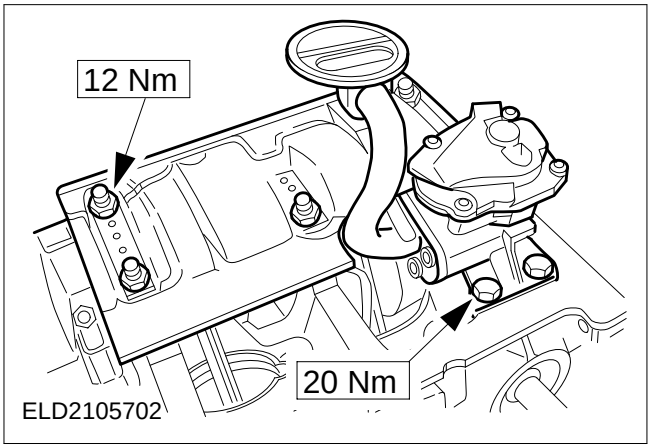
NOTE: Use new bolts.

64. Fit the big-end bearing caps.

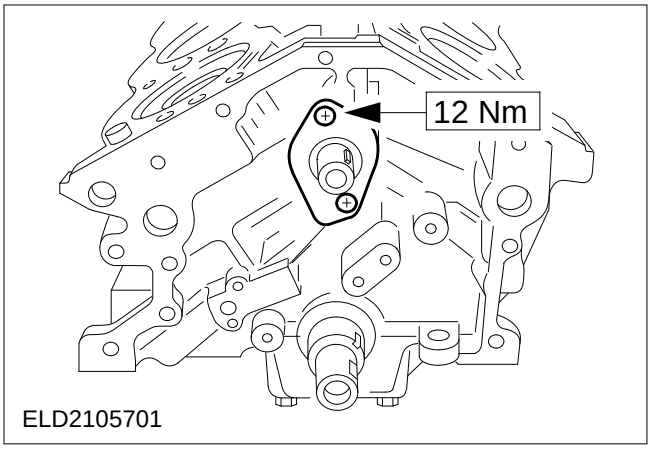
- Lubricate the bearing shells, big-end bearing journals and the bolt threads and bolt contact faces with engine oil.
- Fit the associated bearing caps and bearing shells and secure them.



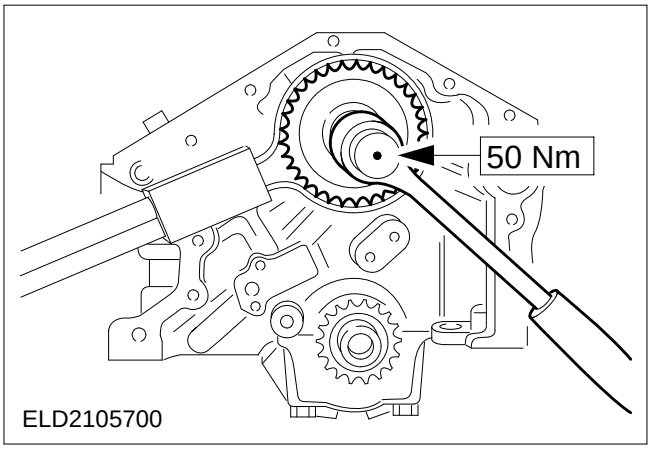
65. Fit the oil pump drive shaft in the hexagonal drive.



66. Fit the oil pump and oil baffle.



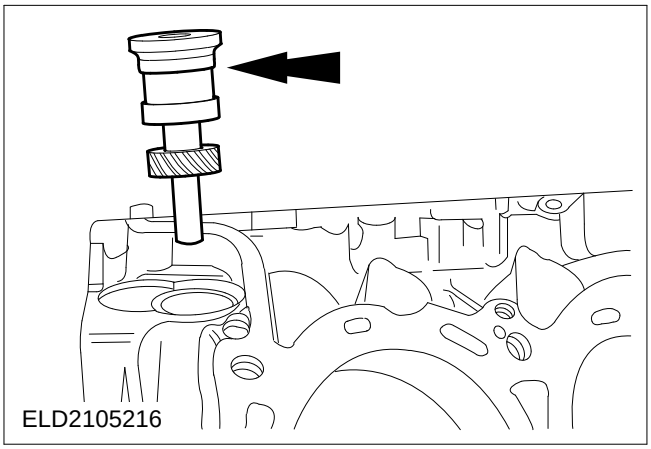
67. Fit the oil pump drive intermediate shaft.



NOTE: Left-hand thread.

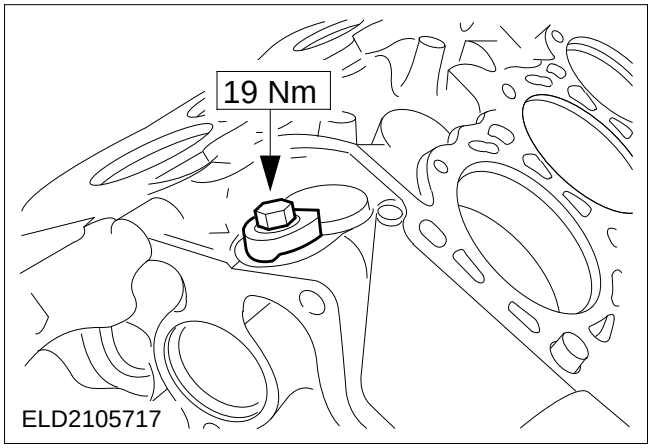
68. Fit the intermediate shaft sprocket.

- Press on the spacer washer (the chamfered side faces the cylinder block).
- Use a universal strap wrench to stop the sprocket from turning.

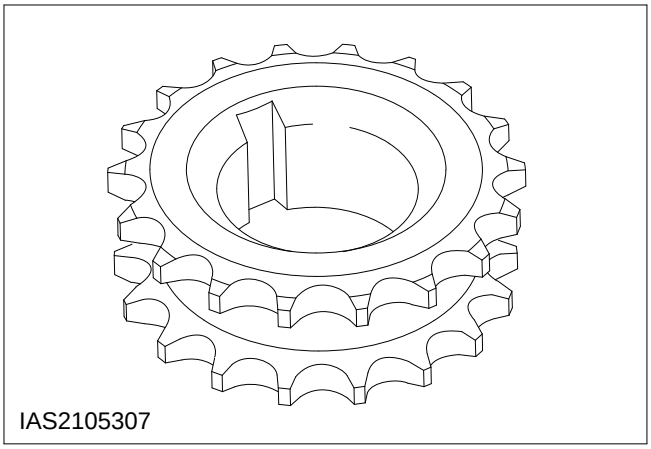


NOTE: Turn the intermediate shaft so that the oil pump drive can click in place.

69. Fit the oil pump drive pinion and the oil pump drive bearing housing with a new oil seal.

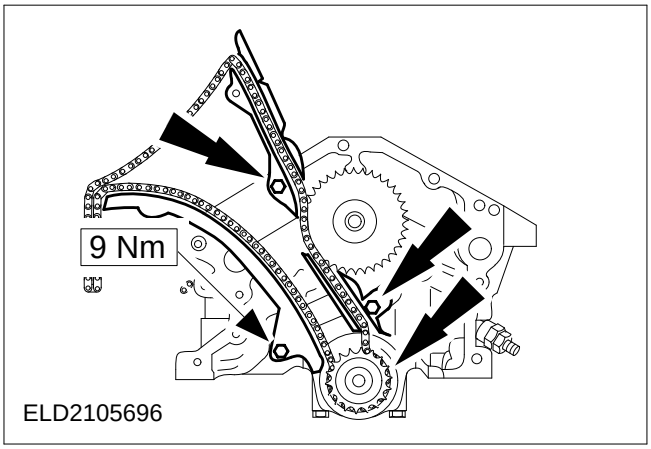


70. Fit the pressure pad of the oil pump drive bearing housing.



NOTE: The chamfer points away from the cylinder block.

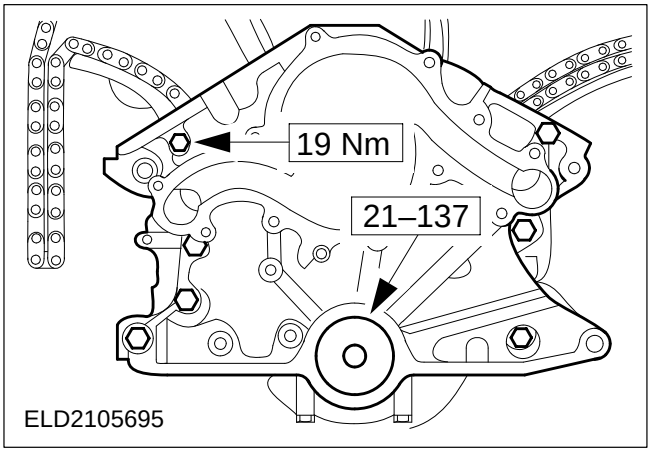
71. Sprocket must be installed facing the correct way.



72. Fit the timing chain housing gasket using sealer (WSK-M4G320-A).

73. Fit the right-hand timing chain.

- Attach the chain guides.
- Fit the crankshaft Woodruff key in the groove.
- Lay the timing chain on the sprocket and push them together onto the crankshaft.



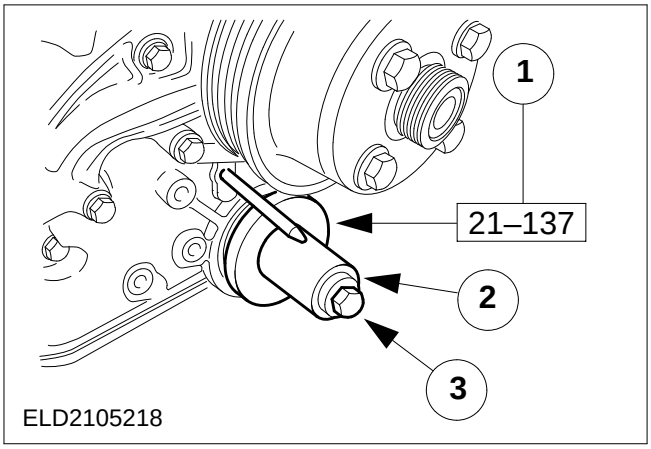
NOTE: The left-hand chain guides are attached to the timing chain housing.

74. Fit the timing chain housing.

- Lay the left-hand timing chain on the sprocket and fit the timing chain housing.
- Align the timing chain housing using the special tool.
- Screw in the timing chain housing bolts finger tight.
- Hold the chain tight.
- Check that the special tool is accessible.

NOTE: Ensure that the timing chain housing and cylinder block mating faces are flush.

- Tighten the eight bolts on the timing chain housing (one on the back at the top).
- Remove the special tool.

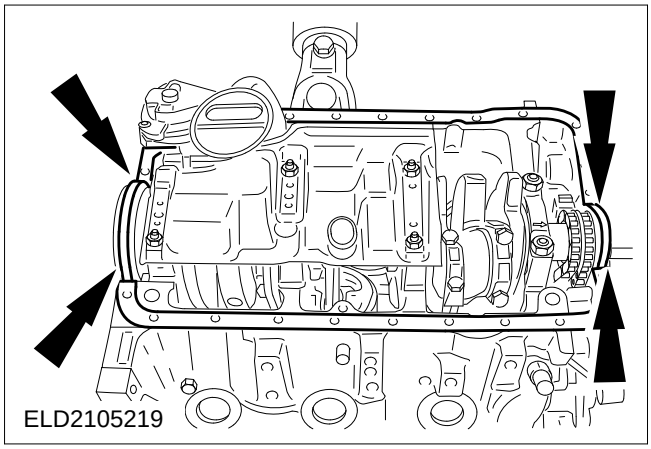


75. Install the crankshaft front oil seal.

1 Special tool

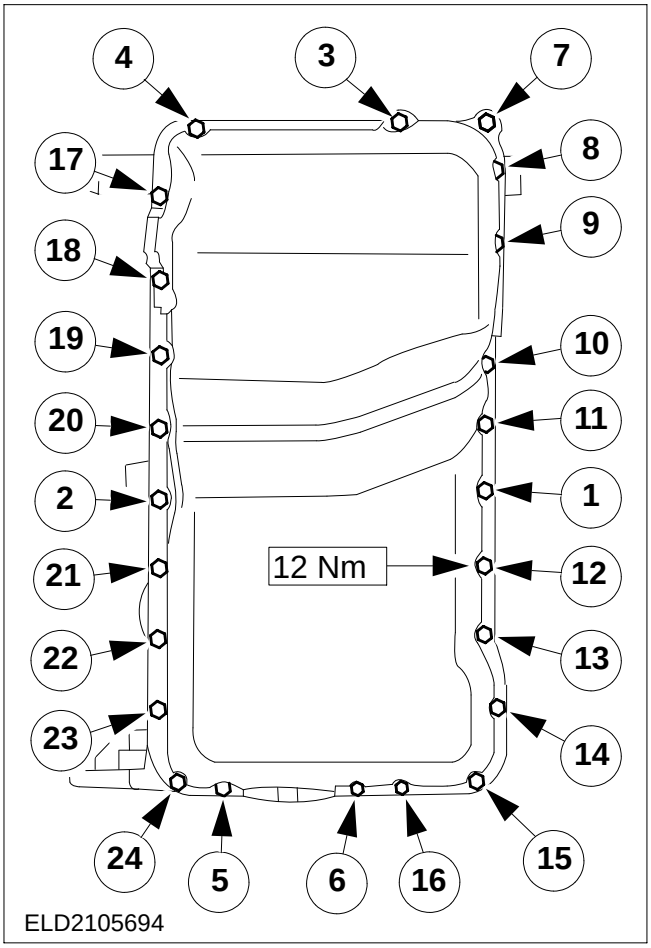
2 Spacer sleeve

3 Bolt on the crankshaft vibration damper.



76. Fit the sump gaskets.

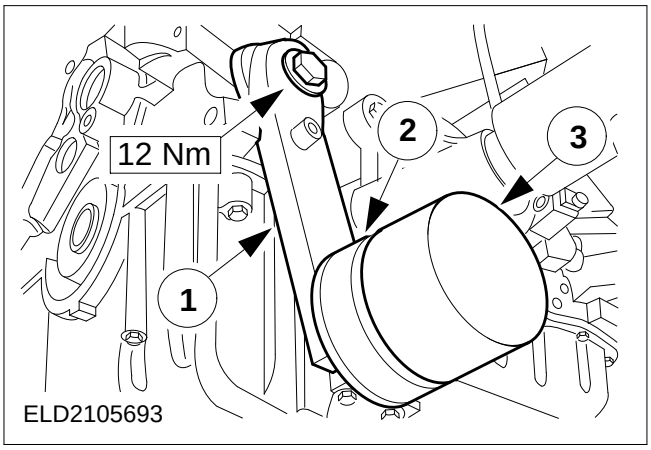
Coat the ends of the new gaskets with sealer (ESK-M4G269).



NOTE: Tightening sequence and different bolt lengths.

77. Fit the sump.

- Bolts five and six: M6 x 115
- Bolts 23 and 24: M6 x 45
- All other bolts: M6 x 20

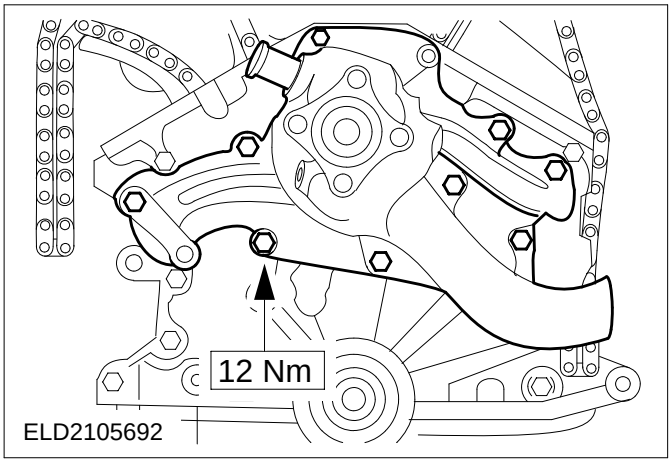


78. Fit the oil filter connector.

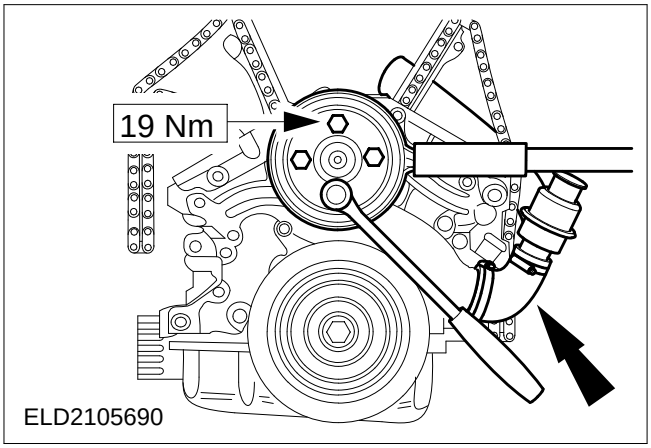
1 Oil filter connector with a new seal.

2 Oil cooler

3 New oil filter.



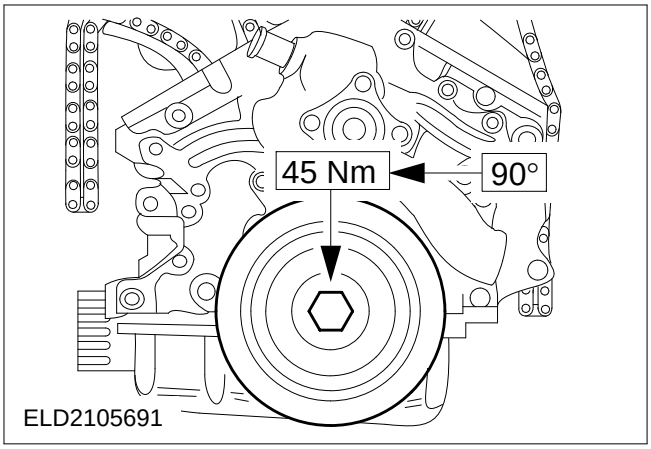
79. Fit the coolant pump with a new gasket.



80. Fit the coolant pump pulley.

Use a universal strap wrench to stop the pulley from turning.

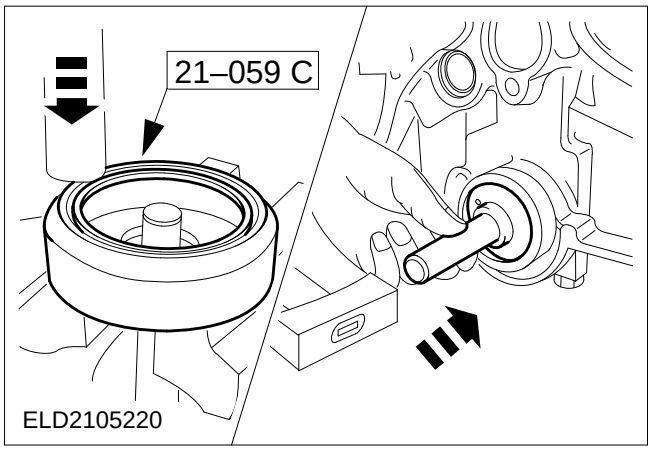
81. Fit the coolant hose.



NOTE: The stepped side of the disc faces the cylinder block.

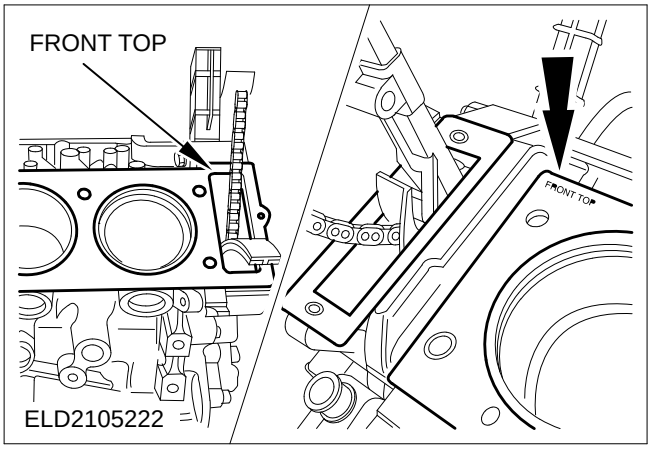
82. Fit the crankshaft vibration damper.

- Immobilise the flywheel with locking tool 21–135.
- Fit a new O-ring.
- Remove the immobilising tool.



83. Fit the crankshaft rear oil seal.

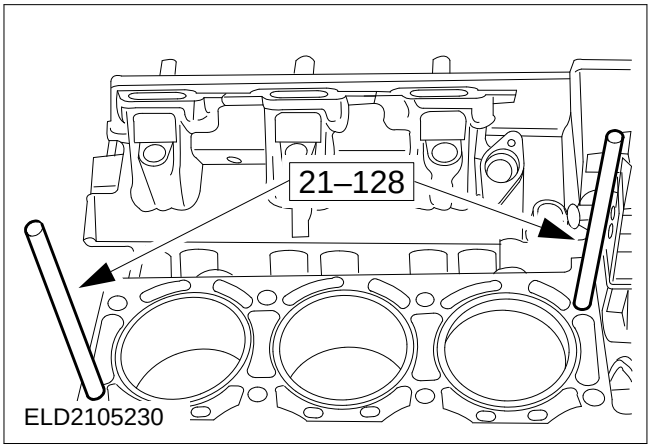
- Insert a new oil seal into the special tool.
- Fit the oil seal.



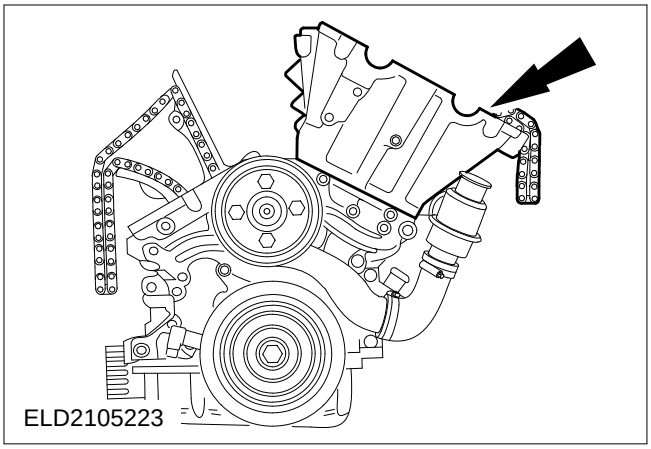
NOTE: FRONT TOP marking.

84. Fit the cylinder head gaskets.

Cut through the left-hand cylinder head gasket, remove the corners and smooth off any sharp edges.

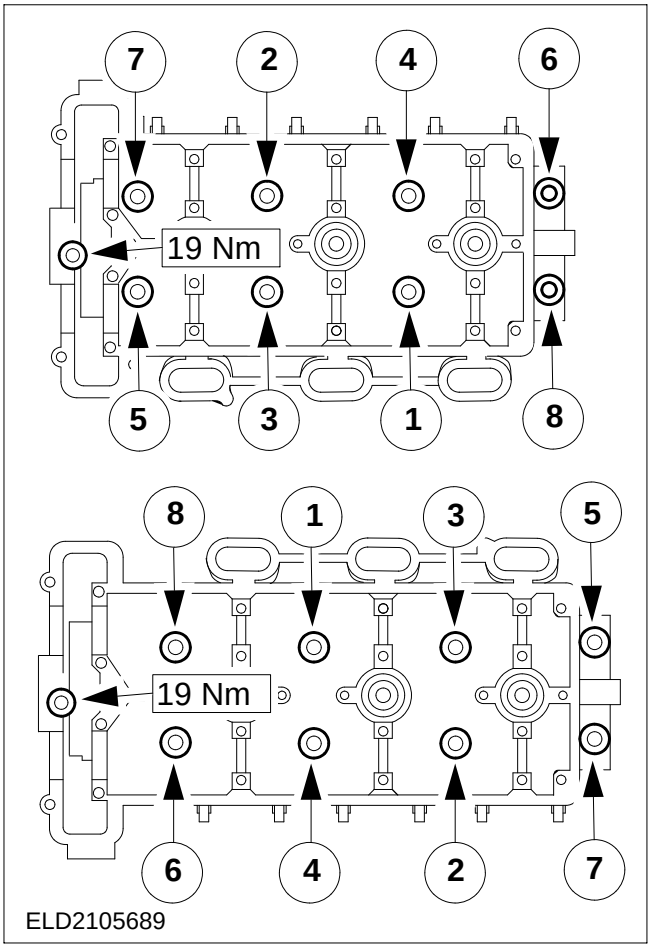


85. Insert the studs into the cylinder block.



86. Fit the cylinder heads (left-hand side shown.

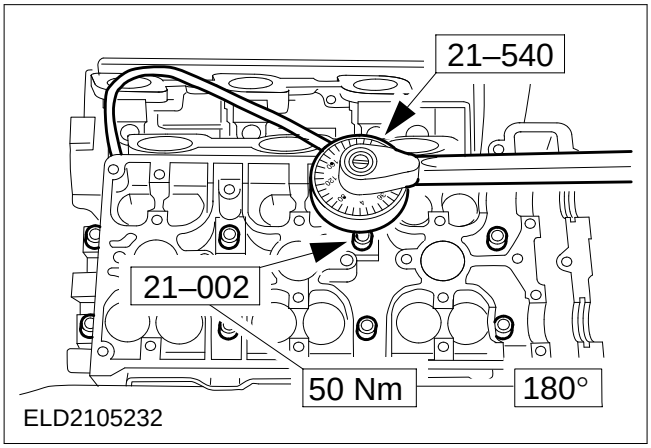
- Fit the cylinder heads.
- Guide the timing chains through the timing chain housing and secure them to prevent them from falling in.



NOTE: The cylinder head bolts may only be reused twice. Mark them with a punch mark on the bolt head when they are reused.

87. Fit the left-hand cylinder head (continued).

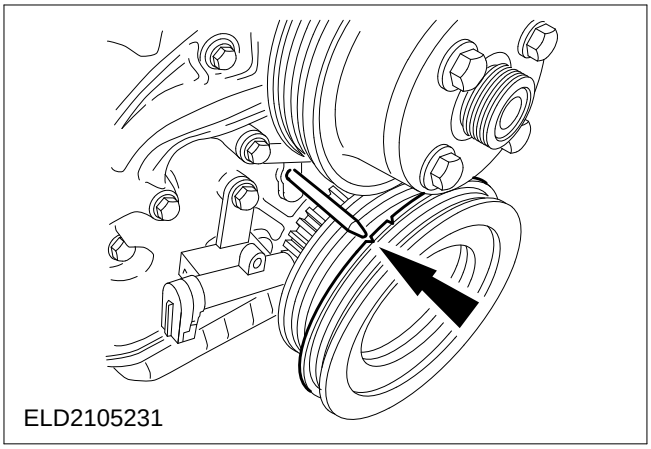
- Insert the cylinder head bolts and tighten them to the first stage in the indicated sequence.
- Screw in the timing chain housing bolt.



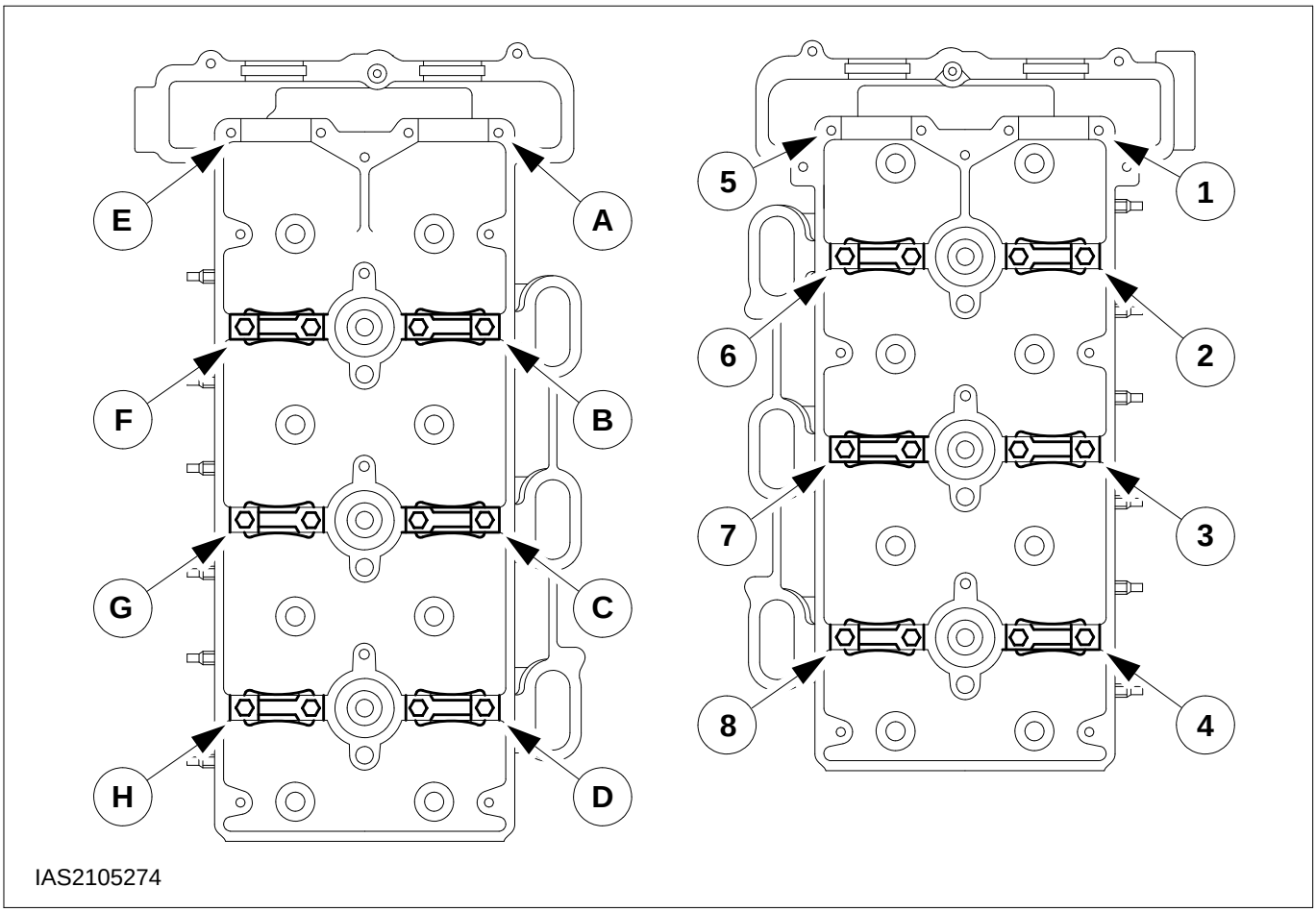
ELD2105232

NOTE: Tightening sequence (see sub-operation 87.).

88. Tighten the cylinder head bolts.


ELD2105231

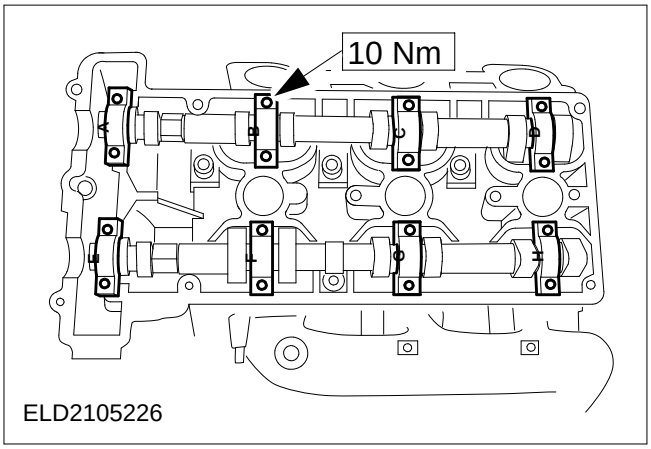
89. Set the crankshaft to the TDC marking for cylinder no. 1.



IAS2105274

NOTE: The wider contact areas of camshaft bearing caps 1 and 5 and A and E point towards the middle.

90. Identification of the camshaft baring caps.



ELD2105226

91. Fit the hydraulic tappets.

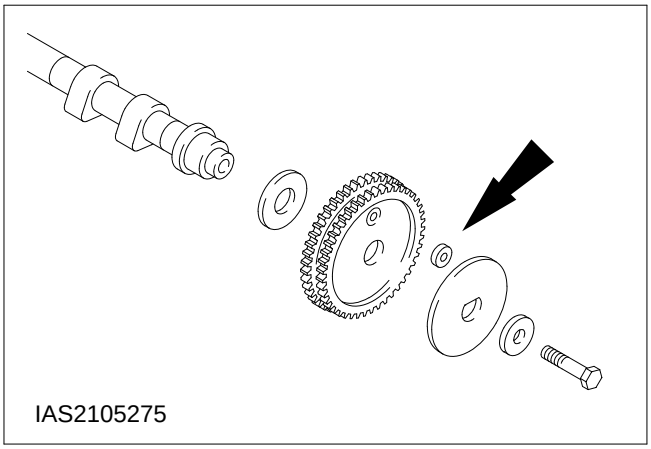
NOTE: Tightening sequence: evenly, working diagonally from the inside outwards.

92. Install the camshafts for the right-hand cylinder head.

- The inlet cams on camshaft 1 must be vertical at cylinder no. 1.
- The exhaust cams on camshaft 2 must be vertical at cylinder no. 1.
- Fit the camshaft bearing caps.

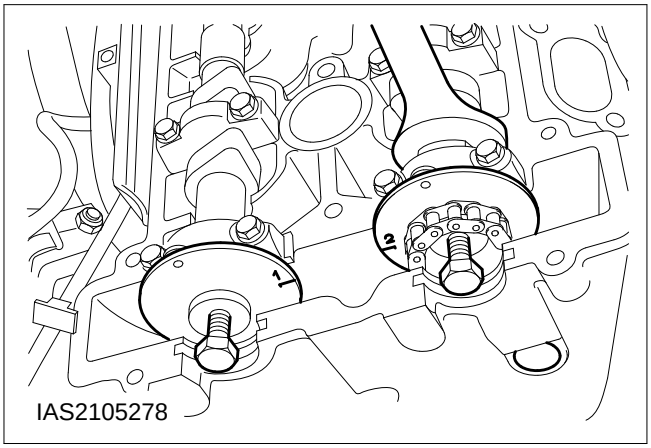
93. Install the camshafts for the left-hand cylinder head.

- The inlet cams on camshaft 3 must be vertical at cylinder no. 6.
- The exhaust cams on camshaft 4 must be vertical at cylinder no. 4.
- Fit the camshaft bearing caps.


IAS2105275

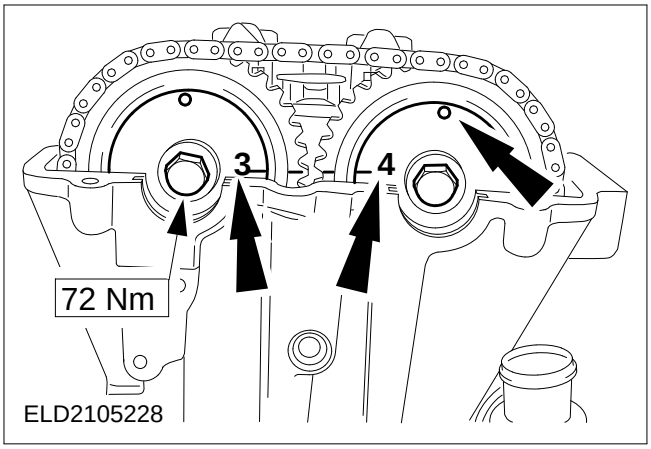
NOTE: The drive plate follower must engage in the bore on the camshaft sprocket.

94. Camshaft components.



95. Set the camshafts to the timing marks.

- Push on the thrust washers and drive plates, screw in the bolts a few turns.
- Set the camshafts to the timing marks.
- Remove the drive plates.

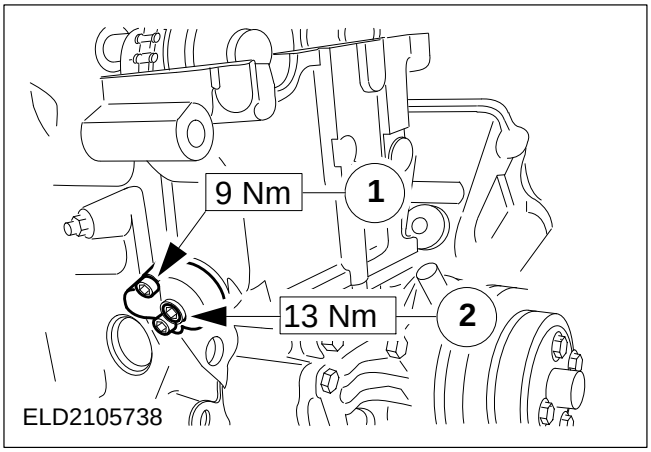


NOTE: Engine is set to TDC.

NOTE: Do not rotate the camshafts.

96. Attach the camshaft sprockets.

- Pull the timing chain tight on the driving run (the opposite side to the chain tensioner), and working from this side attach the camshaft sprockets (do not yet tighten the bolts).



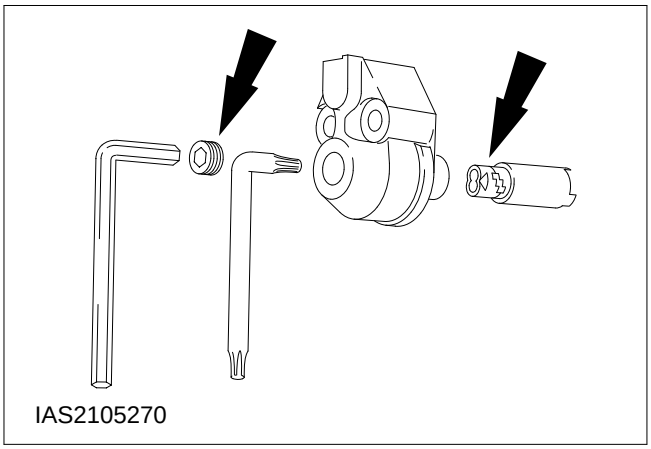
NOTE: The left and right-hand chain tensioners are different (thin left-hand inner spacer and thick right-hand inner spacer). The chain tensioner must be locked before installation.

97. Fit the right and left-hand chain tensioners

1 Screw in the bolts.

Tension the timing chain according to step 98.

2 Screw in chain tensioner blanking plugs (4,5 mm).

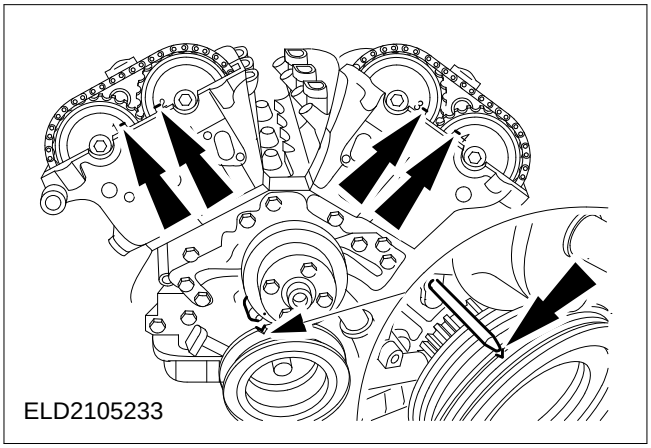


NOTE: The chain tensioner is released once there is an audible click and when it has reached its stop.

98. Tighten the timing chains.

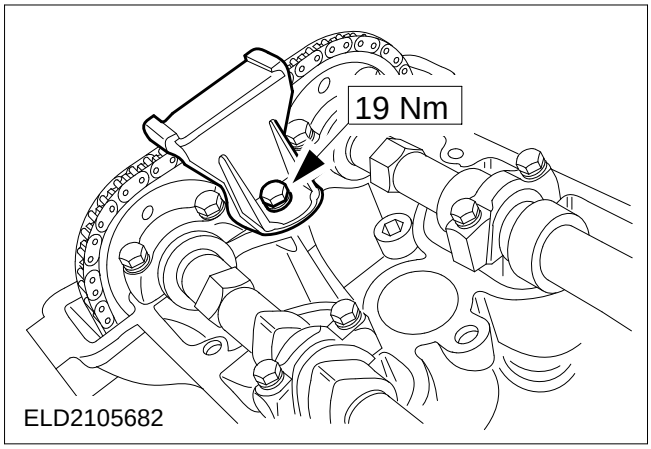
NOTE: Use the TORX T30 angled socket.

Twist the chain tensioner anti-clockwise to release it.


ELD2105233

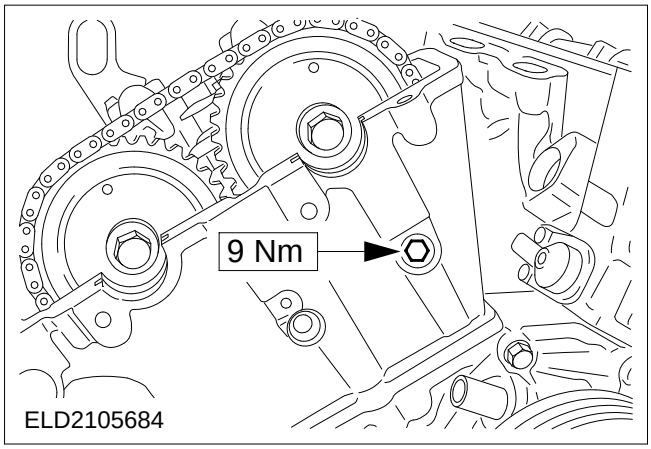
99. Carefully turn the engine through two rotations and check the valve timings.

If necessary, follow steps 53. to 56. to correct the valve timings.



ELD2105682

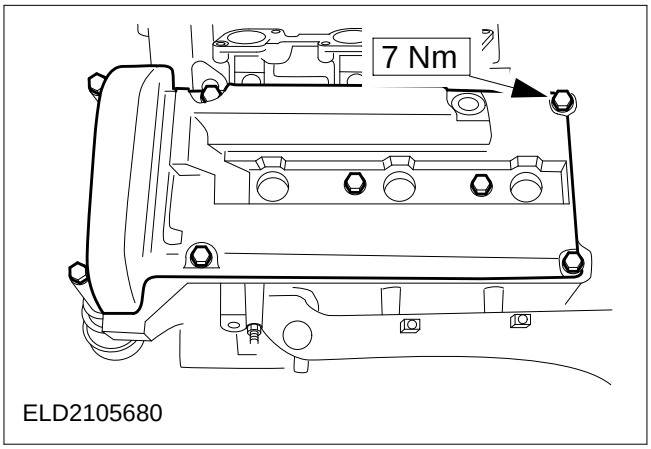
100. Fit the upper chain guides.



ELD2105684

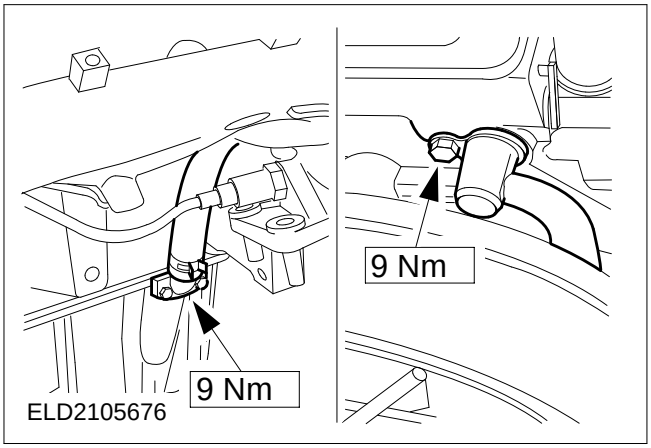
101. Fit the right-hand chain guide bolt.

- Screw in the chain guide bolt.
- Fit the blanking plug in the bore using a new O-ring.

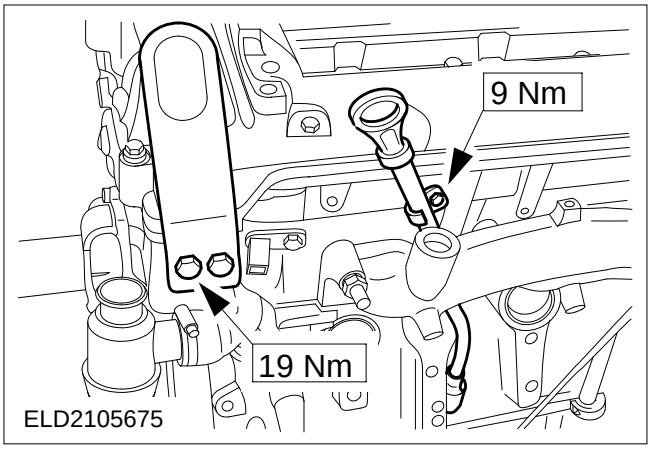


ELD2105680

102. Fit the two cylinder head covers (left-hand side shown).

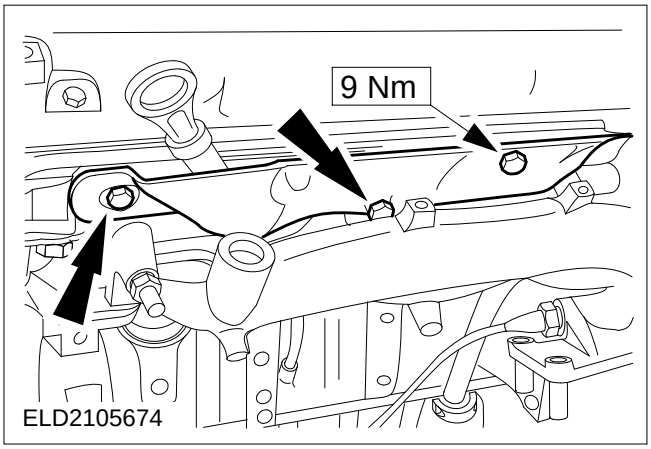


103. Fit the PCV connector (left-hand side shown).

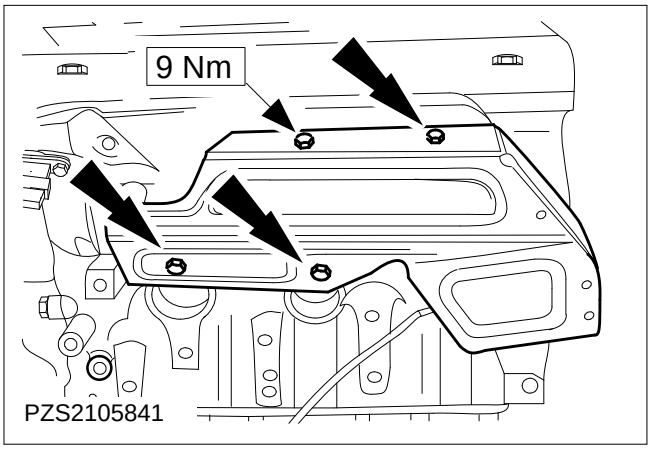


104. Fit the oil dipstick tube and engine lifting eye.

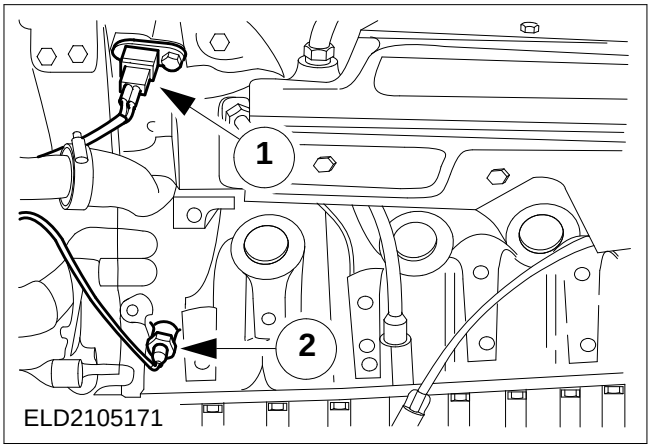
Insert the oil dipstick.



105. Fit the cylinder head heat shields (left-hand side shown).



106. Fit the exhaust manifold heat shields (left-hand side shown).



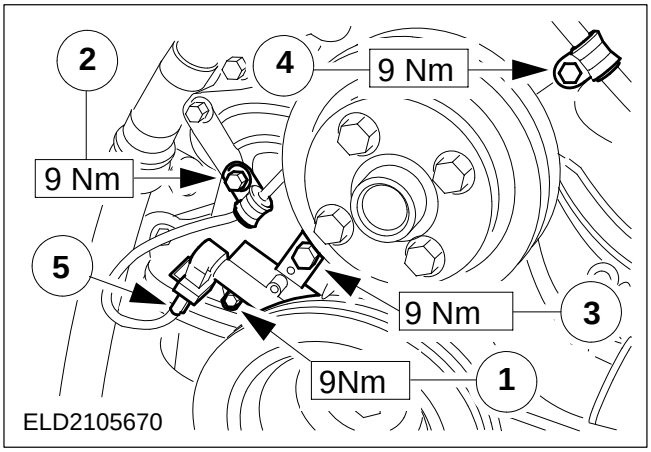
107. Connect the CMP sensor multiplug and fit the oil pressure switch.

Route the wiring loom.

1 Camshaft position (CMP) sensor.

2 Oil pressure switch.

Connect the oil pressure switch multiplug.



108. Fit the CKP sensor and the clips.

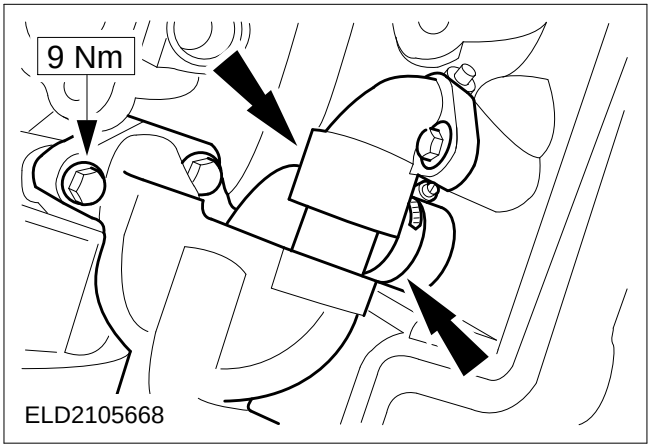
1 CKP sensor.

2 CKP sensor wiring clip.

3 Bracket for CKP sensor.

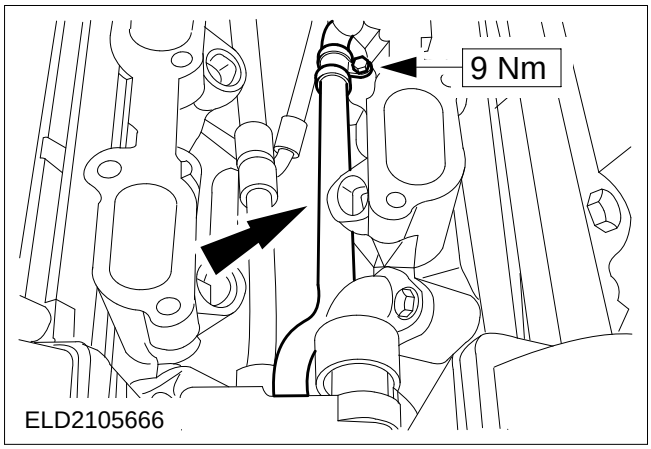
4 CMP sensor wiring clip.

5 CKP sensor plug.

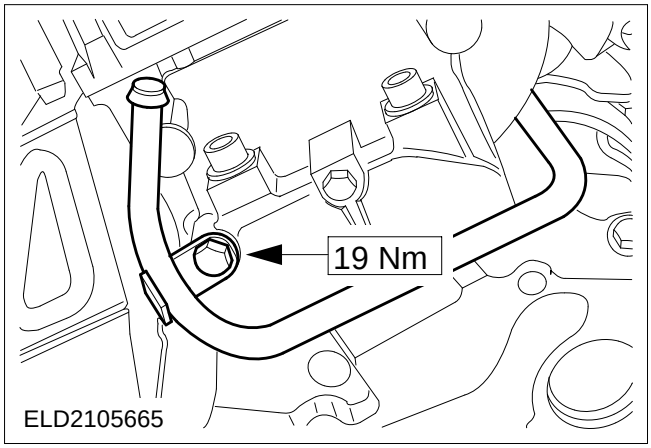


109. Fit the thermostat housing.

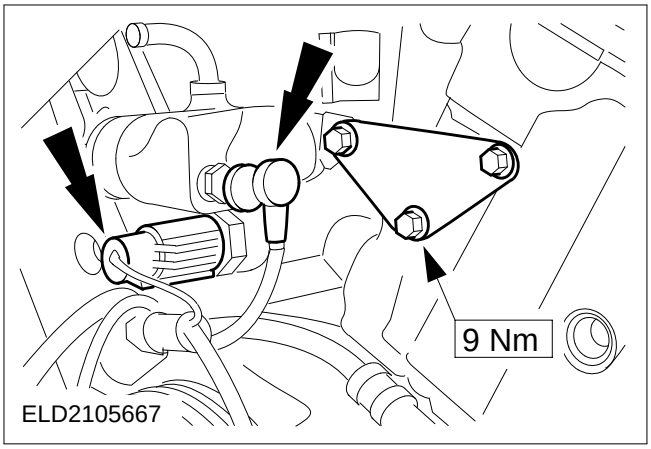
- Guide in the thermostat housing and attach the coolant hose.
- Fit the three thermostat housing bolts.
- Fit the connector.



110. Fit the coolant pipe.

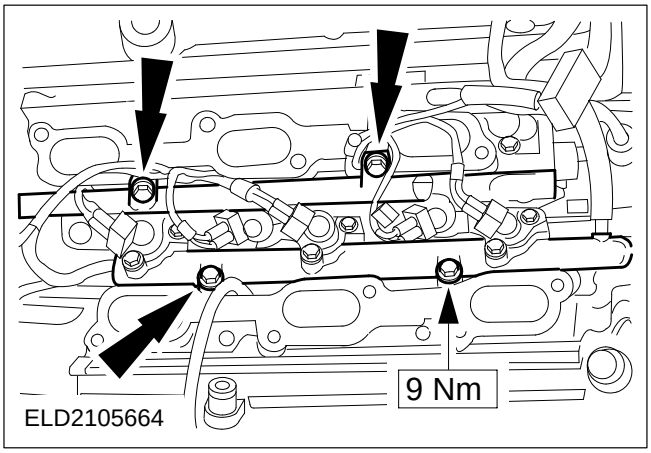


111. Fit the coolant pipe (continued)



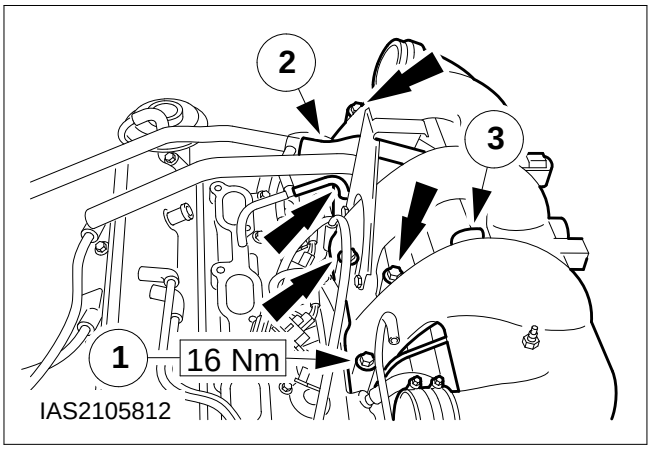
112. Connect the plugs and fit the thermostat housing bracket.

- Engine coolant temperature (ECT) sensor plug.
- Temperature gauge sender unit plug.
- Thermostat housing bracket.



113. Fit the fuel rails.

Connect the six fuel injection valve multiplugs.



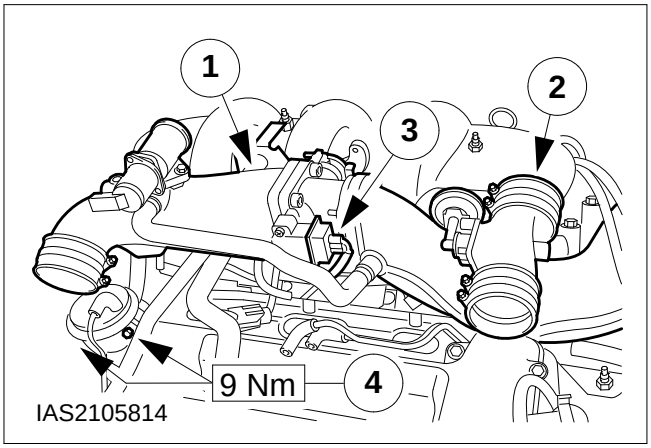
114. Fit the left-hand inlet manifold with a new gasket.

1 Fit the six bolts.

2 Insert the PCV valve into the cylinder head cover.

3 Connect the vacuum hose.

Move the wiring and hoses for the inlet air plenum chamber and the right-hand inlet manifold into installation position.



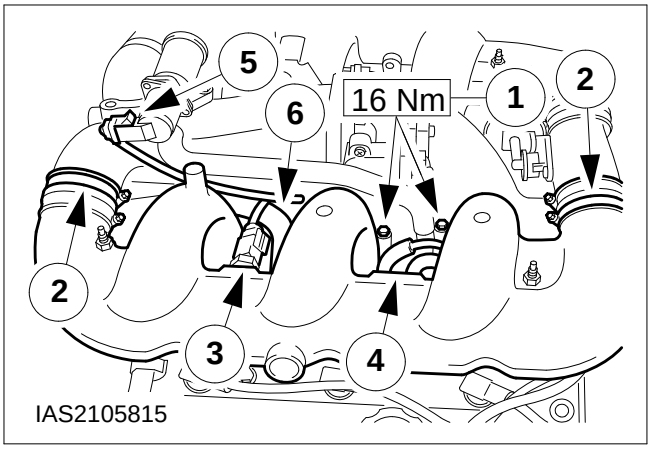
115. Fit the air intake plenum chamber.

1 Push the air intake plenum chamber onto the left-hand inlet manifold.

2 Attach the VRIS.

3 Connect the TP sensor plug.

4 Attach the EGR valve to the inlet manifold (two bolts).



116. Attach the right-hand inlet manifold with a new gasket.

1 Push the inlet manifold onto the air intake plenum chamber and fit the six bolts.

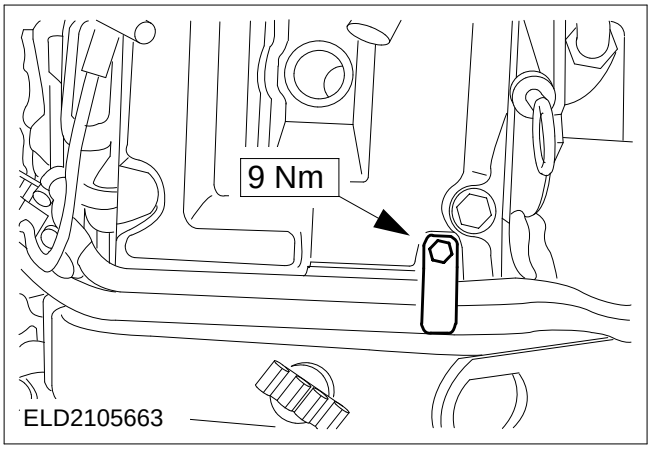
2 Fit the connecting hoses.

3 Connect the IAT sensor multiplug.

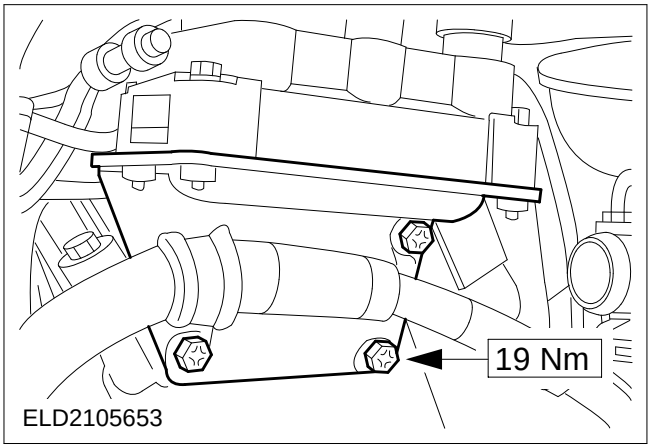
4 Push on the two vacuum hoses.

5 Connect the IAC valve multiplug.

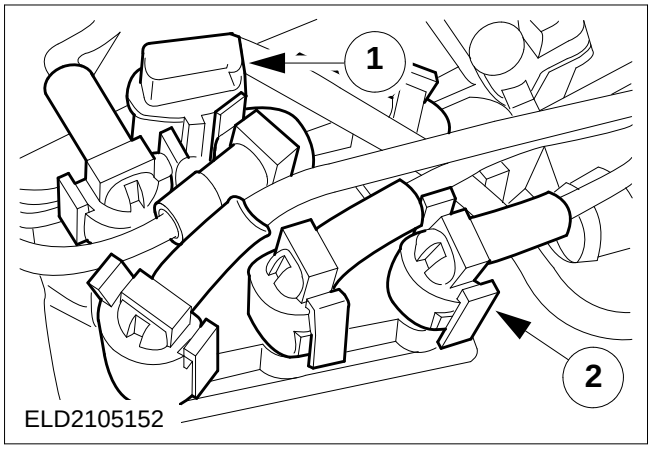
6 Push on the PCV hose and the vacuum hose.



117. Fit the bracket for the PCV hose.



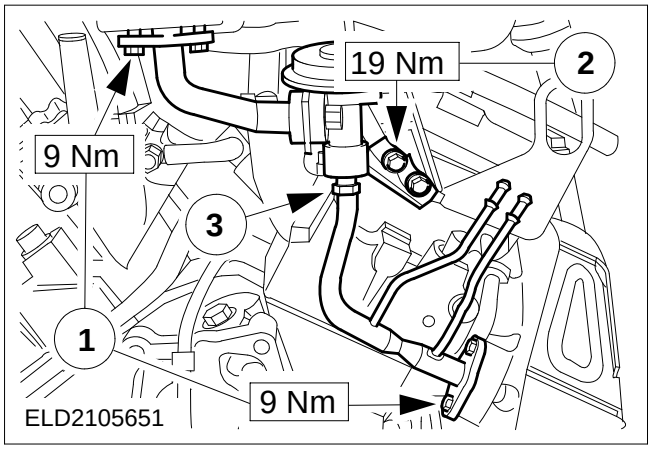
118. Fit the ignition coil bracket.



119. Connect the ignition coil plug.

1 Ignition coil connector

2 HT leads

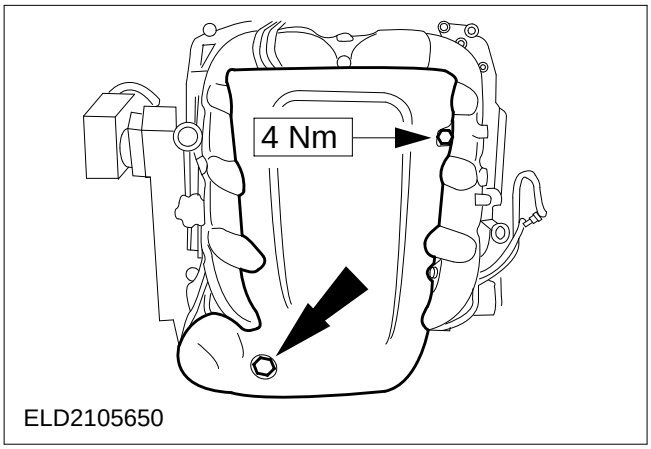


120. Fit the EGR valve.

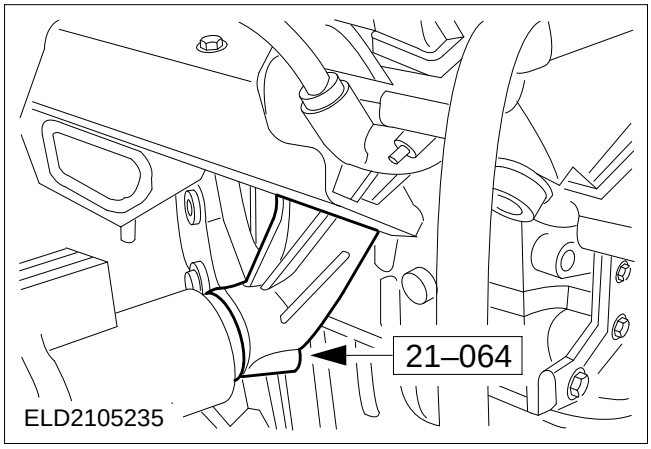
1 Connect the EGR pipes.

2 Fit the EGR valve bracket.

3 Tighten the nut.



121. Fit the inlet manifold cover.



122. Detach the engine from the assembly stand.