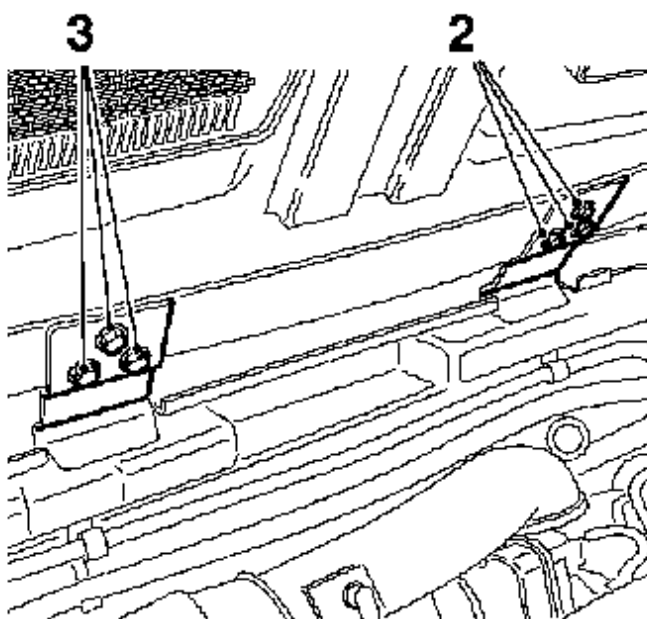
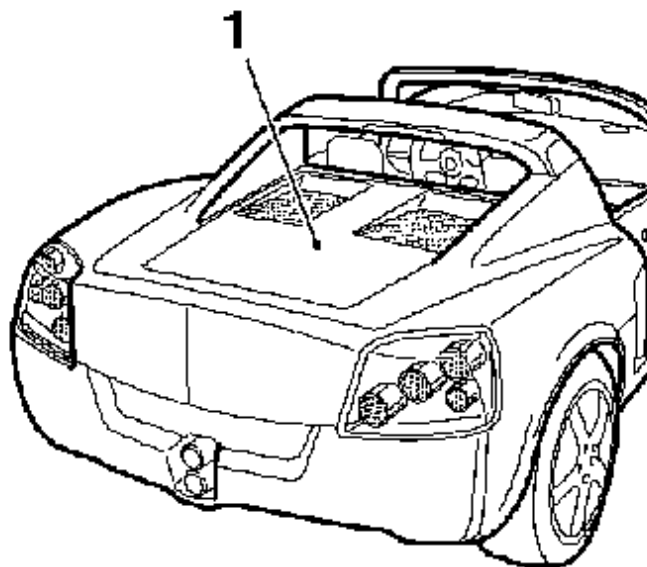


Timing Chain, Balancer Shaft, Replace (Z 22 SE)



Remove

1. Open the bonnet.
2. Disconnect the battery.
3. Open the engine cover (1).
4. Detach the engine cover.
 - 6 bolts (2) and (3)

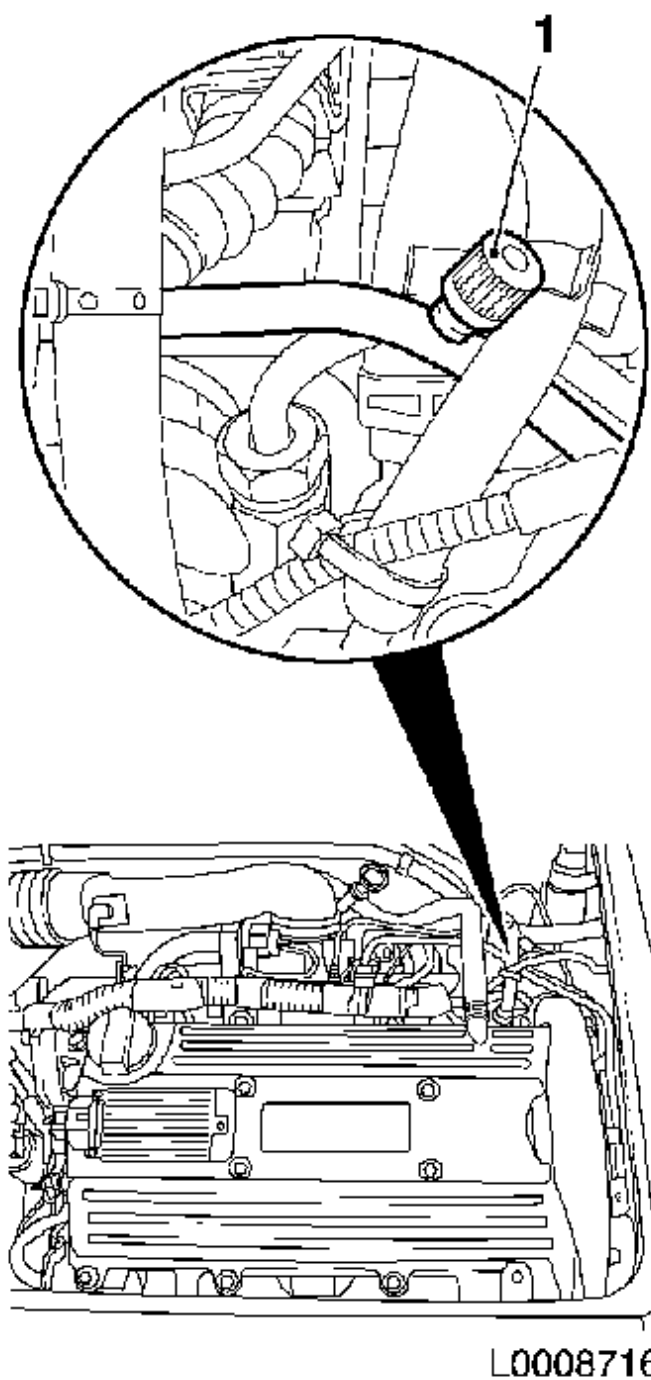


L0008715

5. Release the fuel pressure.

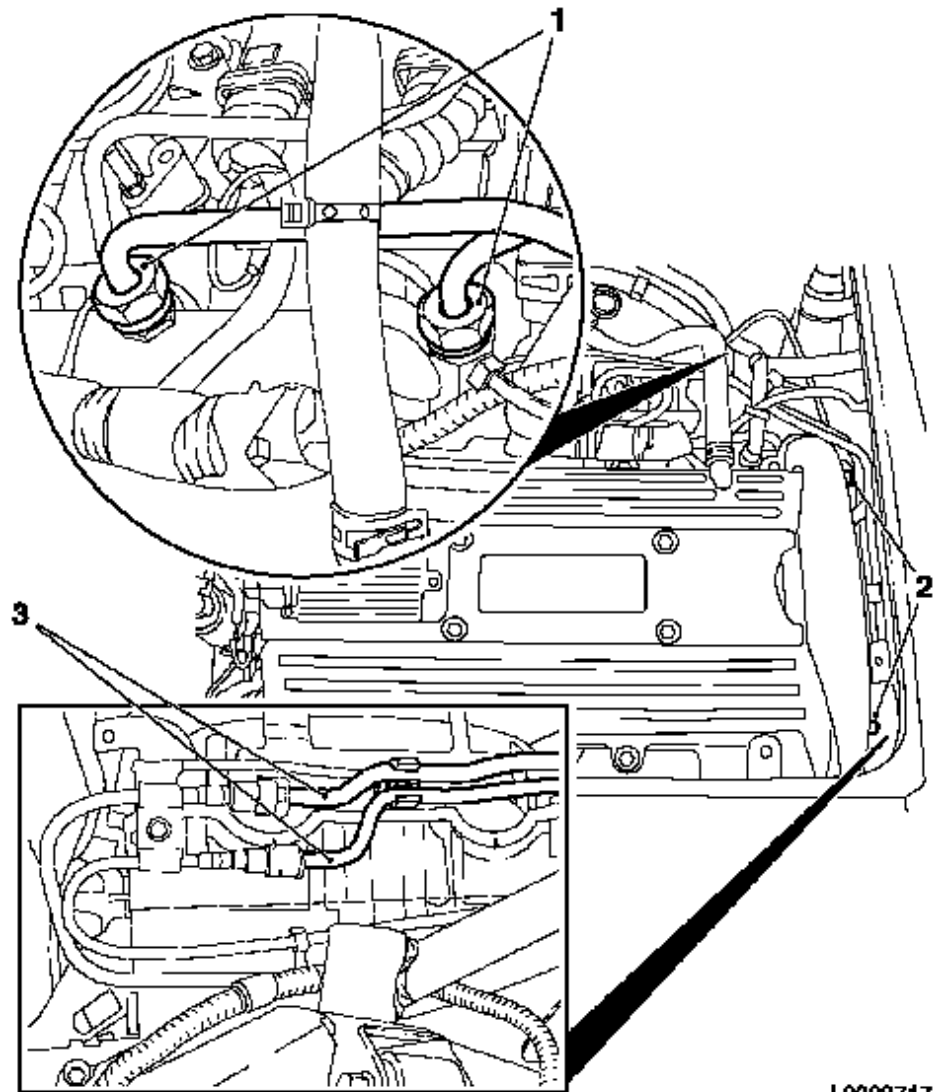
Note: Fuel may escape – observe the safety regulations and relevant national legislation.

 - Release the fuel pressure with the pressure tester **KM-J-34730-91** via test connection (1).
 - Collect any escaping fuel in a suitable container.



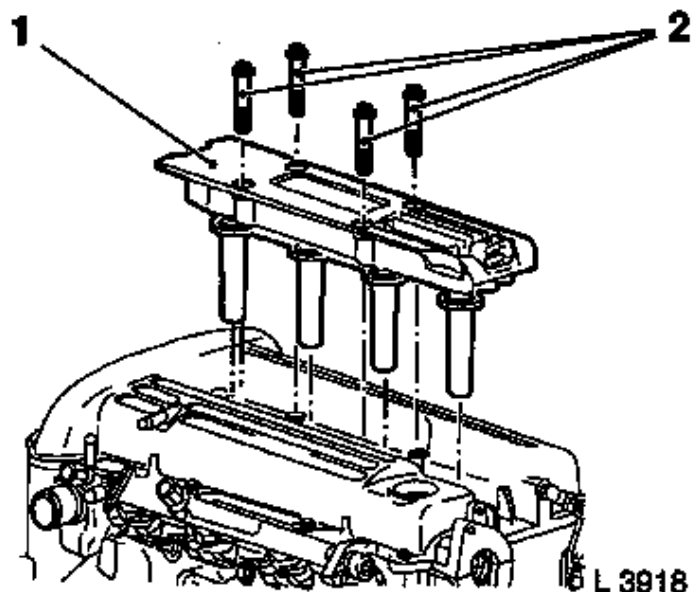
L0008716

6. Disconnect the fuel lines (3).
- 2 union nuts (1)
 - Fuel line bracket
 - 2 bolts (2)
 - Reposition the fuel lines with the fuel line bracket to one side.



L0008717

7. Detach the ignition module (1).
- Release and detach the wiring harness connector.
 - 4 bolts (2)

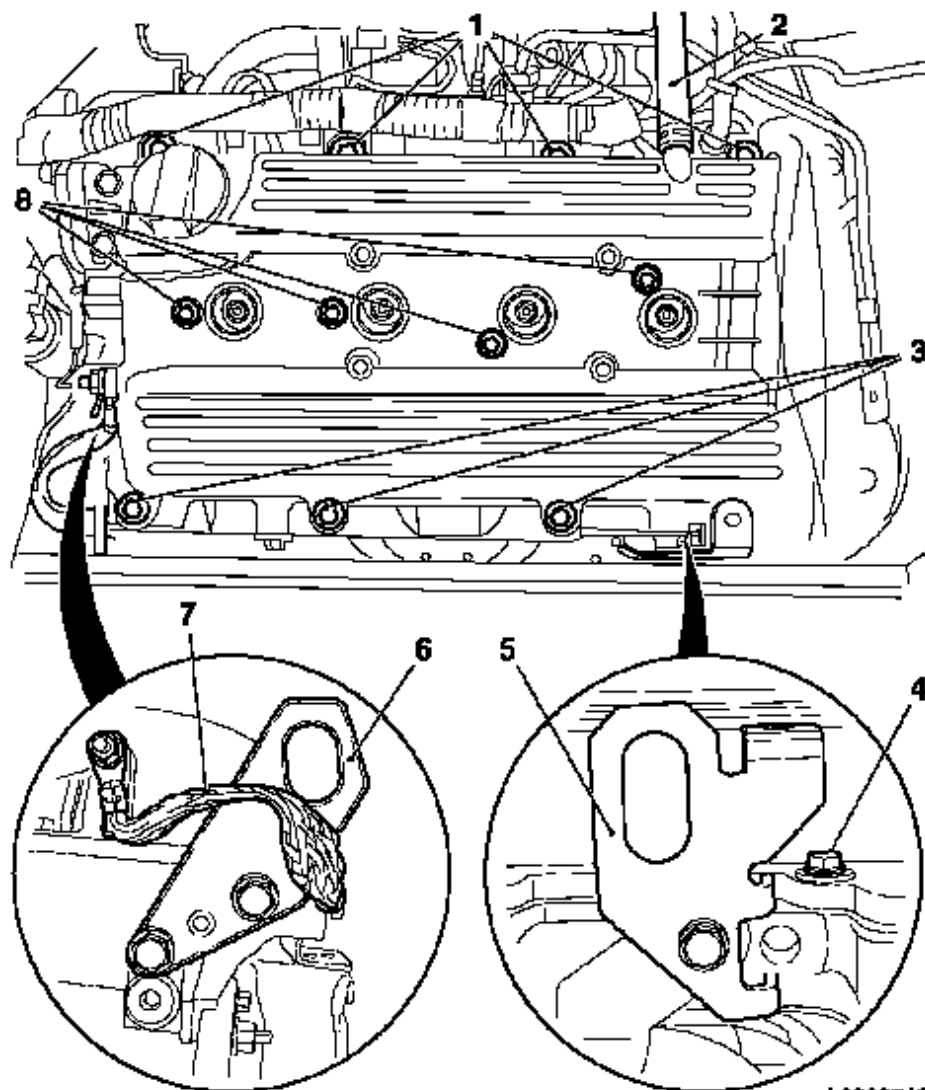


L 3918

8. Remove the cylinder head cover.

- Detach the engine breather hose (2).
- Detach the engine lifting eyes (5) and (6).
 - 2 bolts, 1 nut
- Detach the ground cable (7).
 - 1 bolt
- 12 bolts (1), (3), (4) and (8)

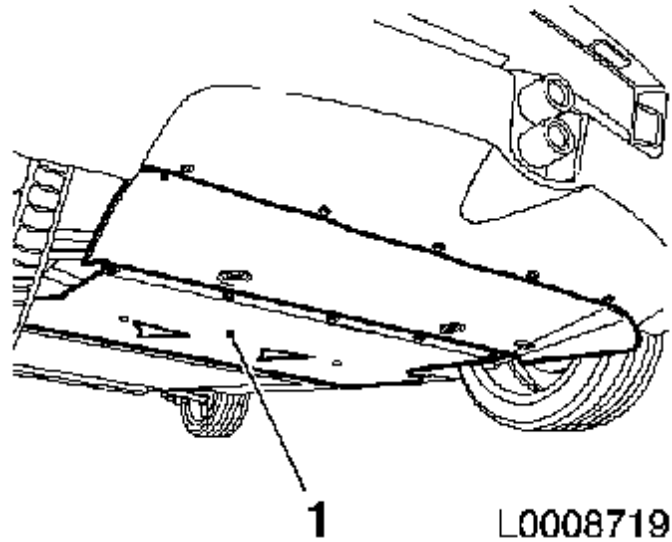
9. Raise the lifting ramp.



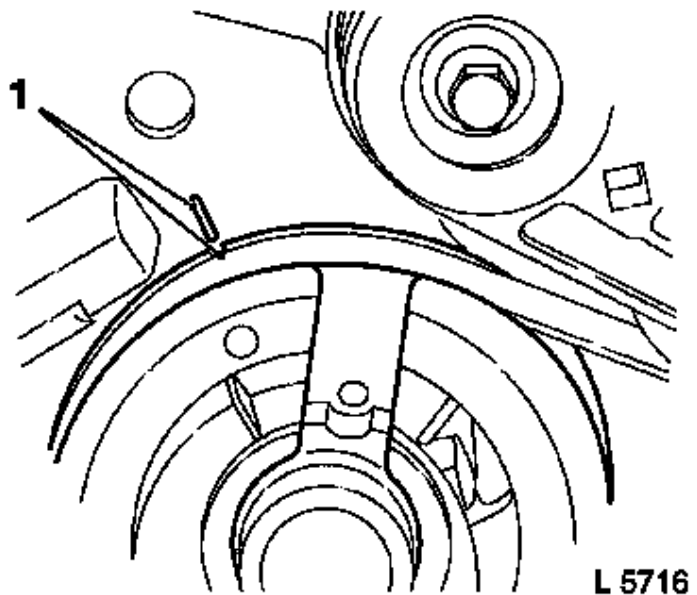
L0008718

10. Remove the lower engine splash shield (1).

- 13 bolts



11. Align the crankshaft.
 - Rotate the crankshaft in the normal direction of rotation to TDC on cylinder no. 4 (marking 1).
12. Lower the lifting ramp.



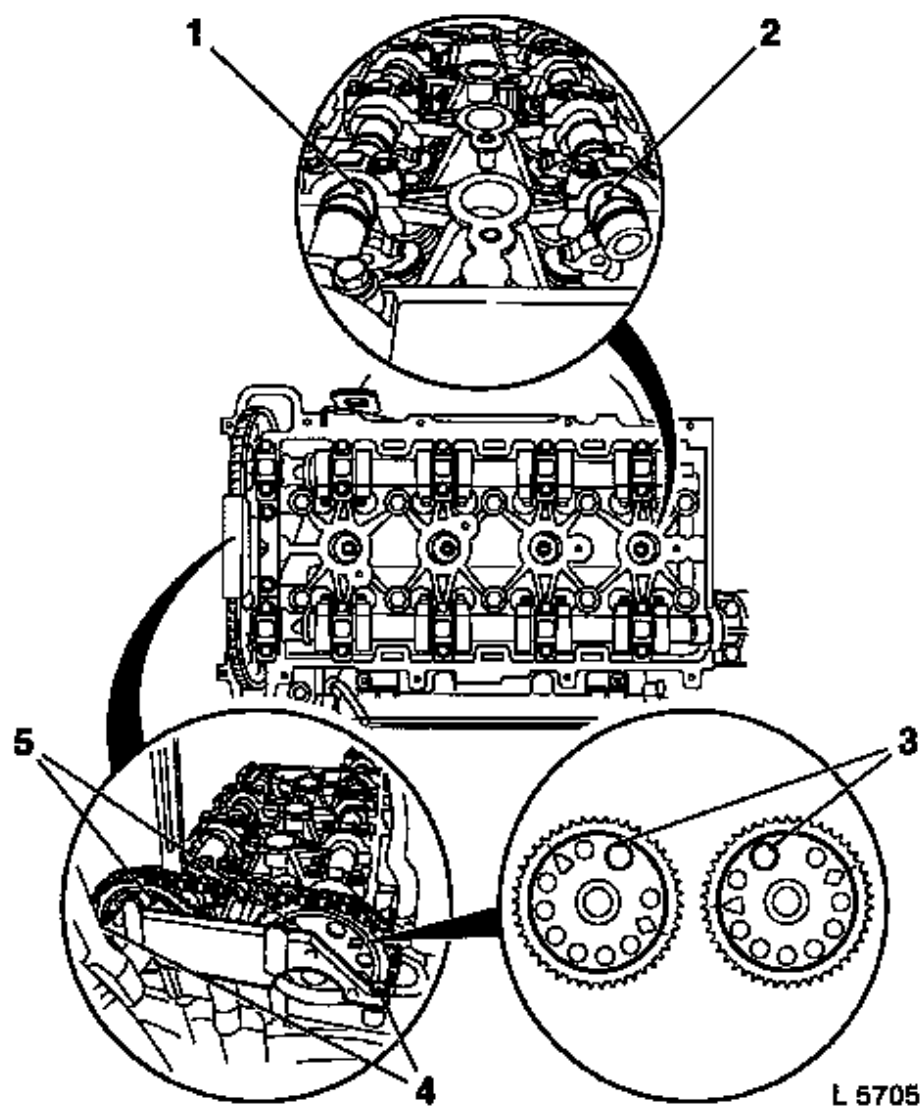
13. Attach **KM-6148**.

Note: In this position the cams (1) and (2) of cylinder no. 4 point upwards.

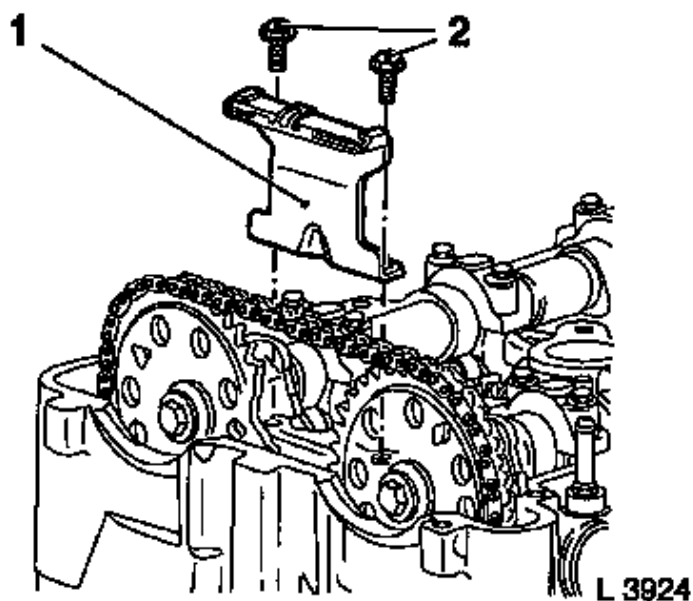
 - Attach **KM-6148** with the enclosed bolts (4).
 - Slide the positioning bolts (5) into the designated bores (3) on the

camshaft
sprockets.

14. Detach **KM-6148**.

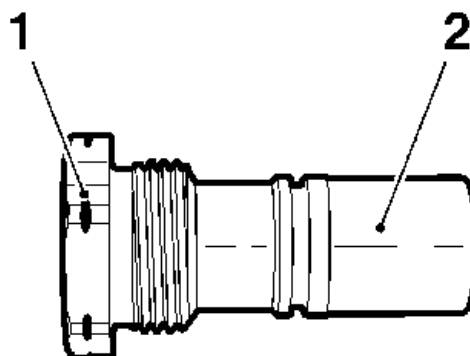


15. Remove the guide rail (1).
• 2 bolts (2)

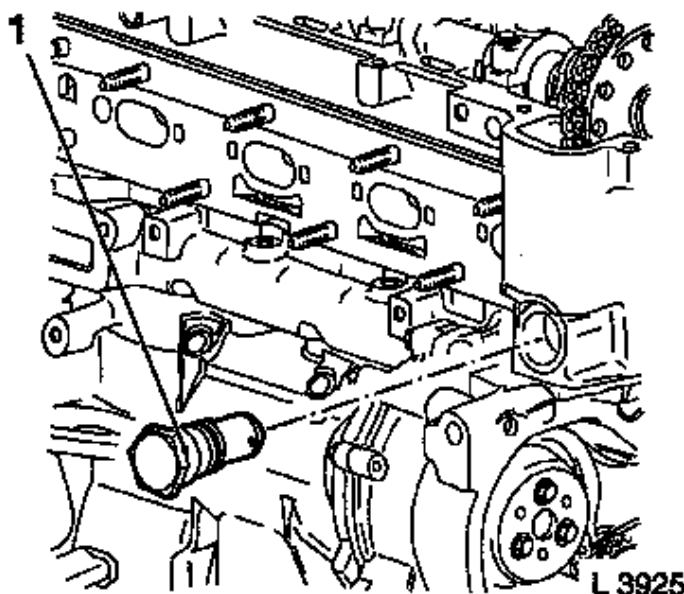


16. Note:

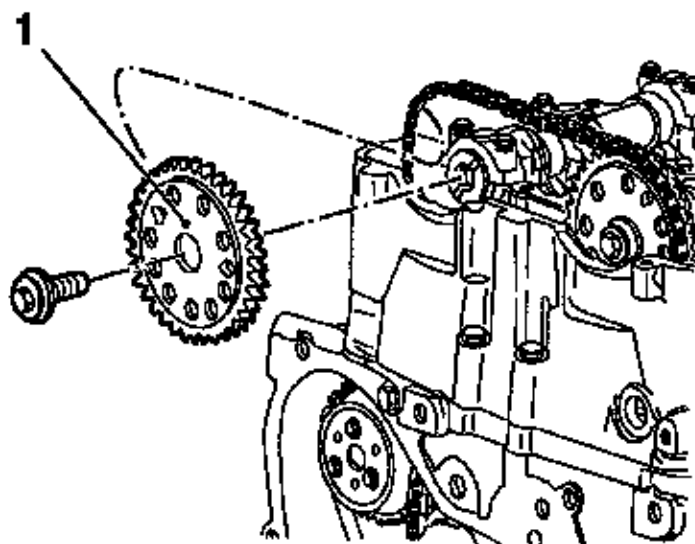
If there is no marking (1) on the camshaft timing chain tensioner (2), then it should be replaced with a new camshaft timing chain tensioner (part number 24 448 509) including a new camshaft timing chain tensioner rail (part number 24 449 448).



L0008542

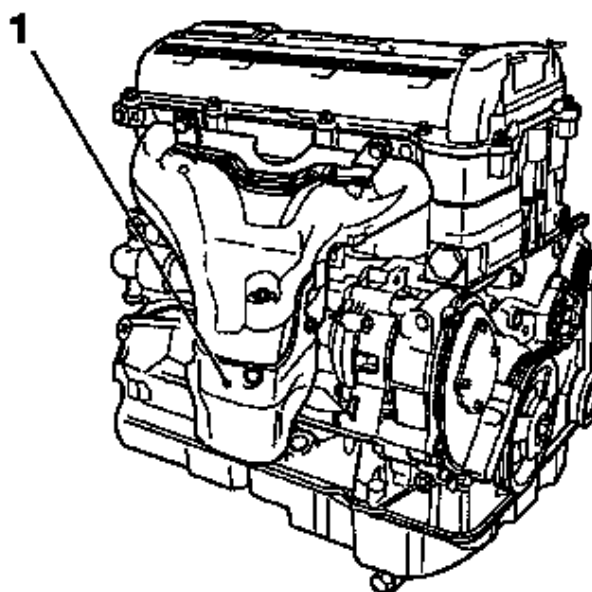
17. Remove the camshaft timing chain tensioner (1).**18. Remove the exhaust camshaft sprocket (1).**

- Hold the exhaust camshaft by the hexagon.



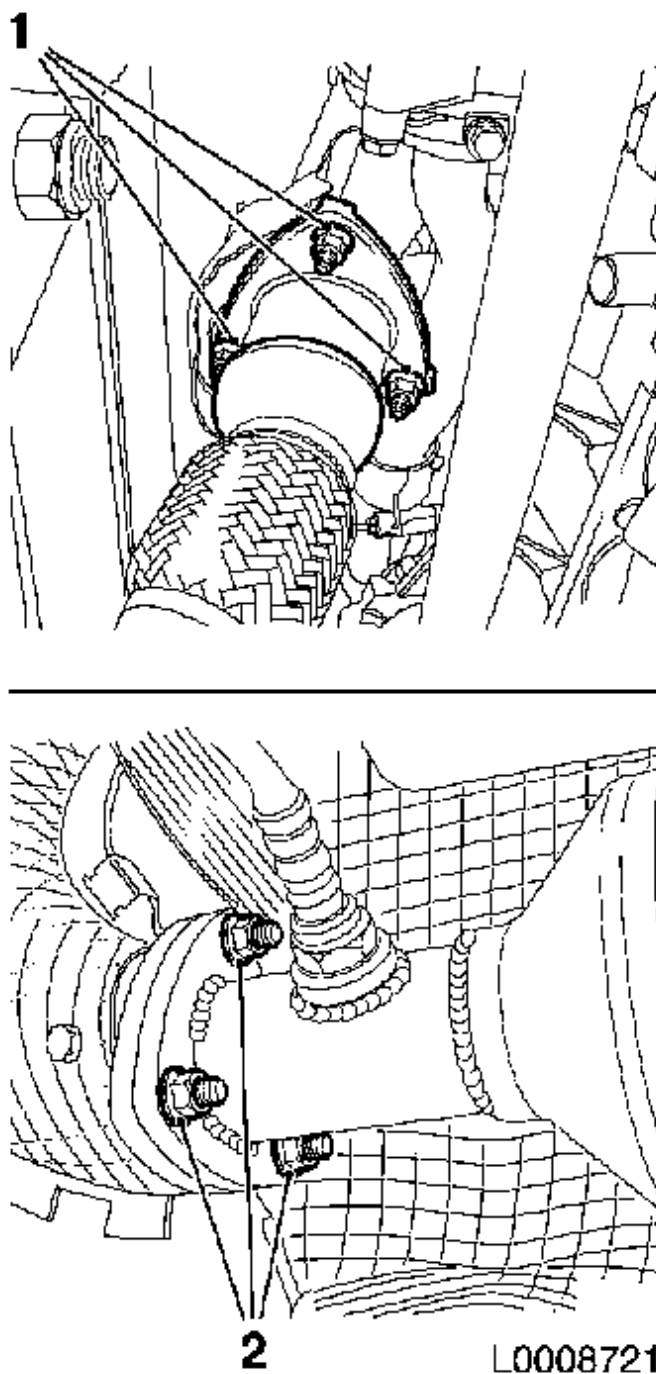
L 3926

19. Remove the lower heat shield (1).
 - 3 bolts
20. Raise the lifting ramp.



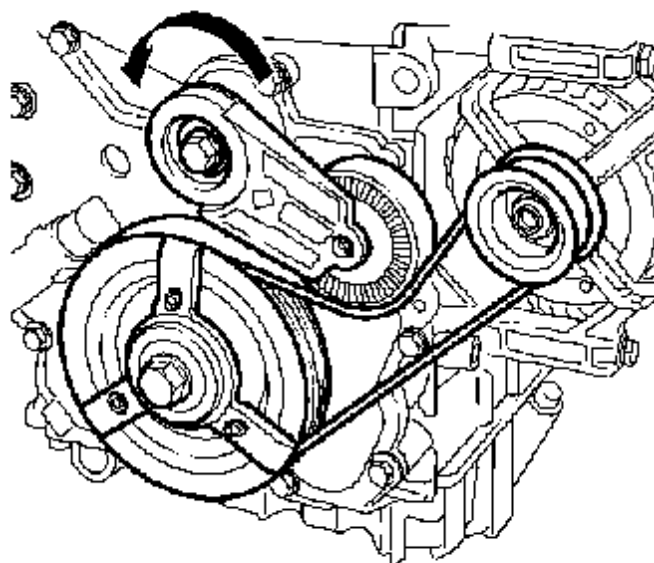
L 3920

21. Place a drip tray underneath.
22. Drain the engine oil.
 - Open the oil drain plug.
 - Install the oil drain plug using a new oil seal.
 - Tightening torque **25 Nm**
23. Detach the front exhaust pipe.
 - 6 nuts (1) and (2), 3 bolts
 - Unhook the exhaust pipe from its mountings.
 - Remove the gaskets.



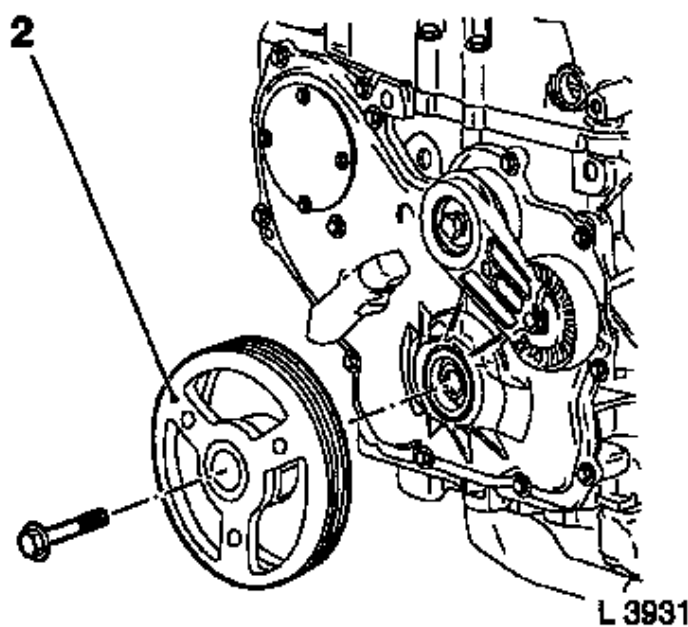
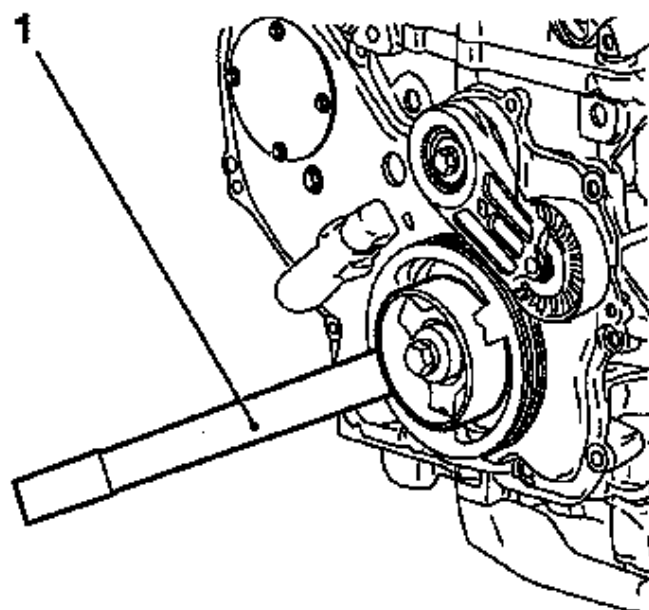
24. Remove the ribbed V-belt.

- Mark the running direction of the ribbed V-belt.
- Tension the ribbed V-belt tensioner in the direction of the arrow with **KM-6151**.
 - Take out the ribbed V-belt.

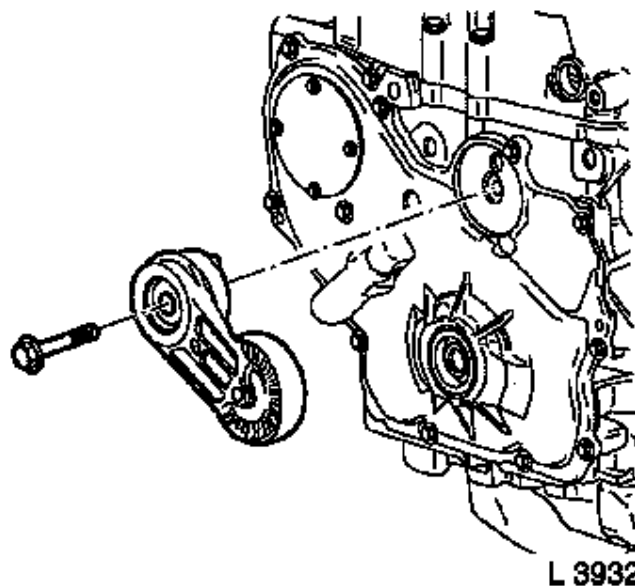


L0008730

25. Detach the rotational vibration damper (2).
- Use holding adapter **KM-J-38122-A** in conjunction with **KM-956-1** (1) to hold.

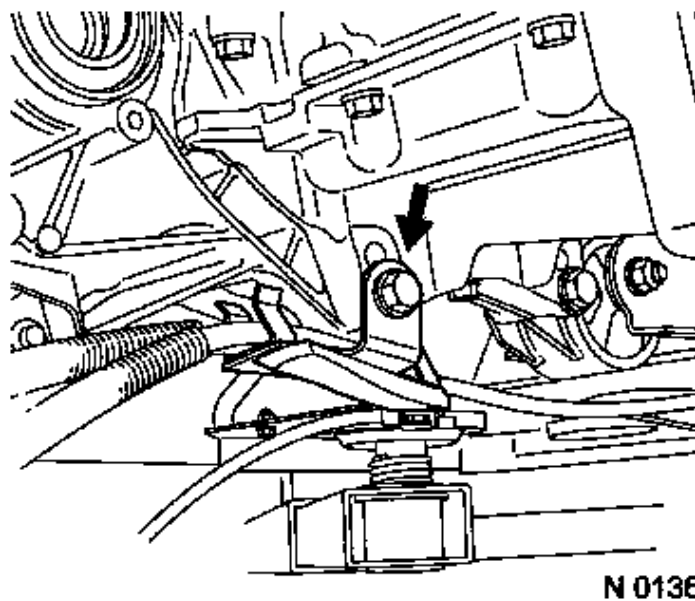


26. Detach the ribbed V-belt tensioner.



27. Detach the bracket for the gearshift cables.

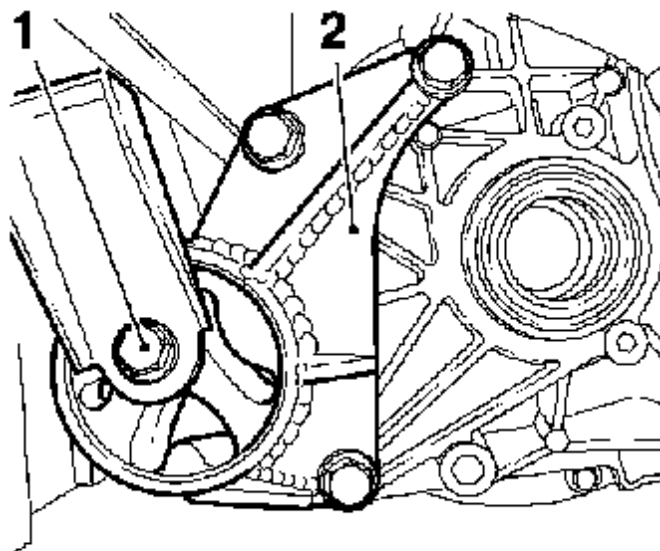
- From the transmission
- 1 bolt (arrow)



28. Support the engine from underneath with **KM-904** together with **KM-6054**.

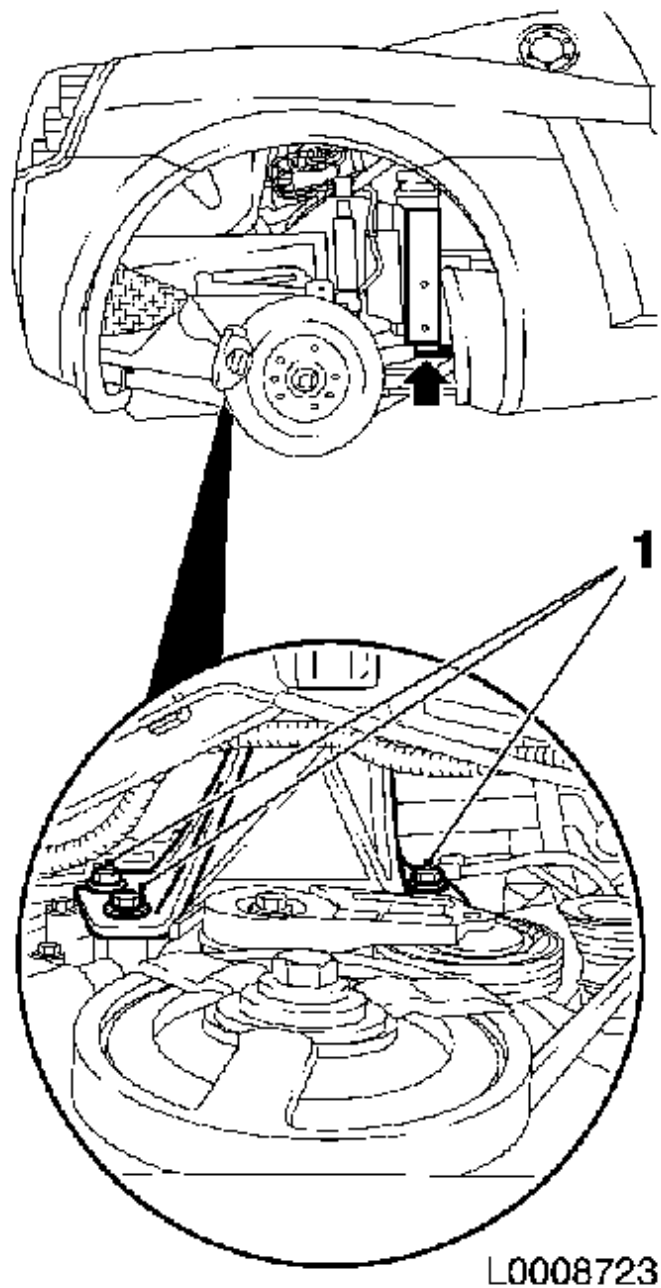
29. Release the rear engine damping block (2).

- 1 bolt (1), 1 nut



L0008722

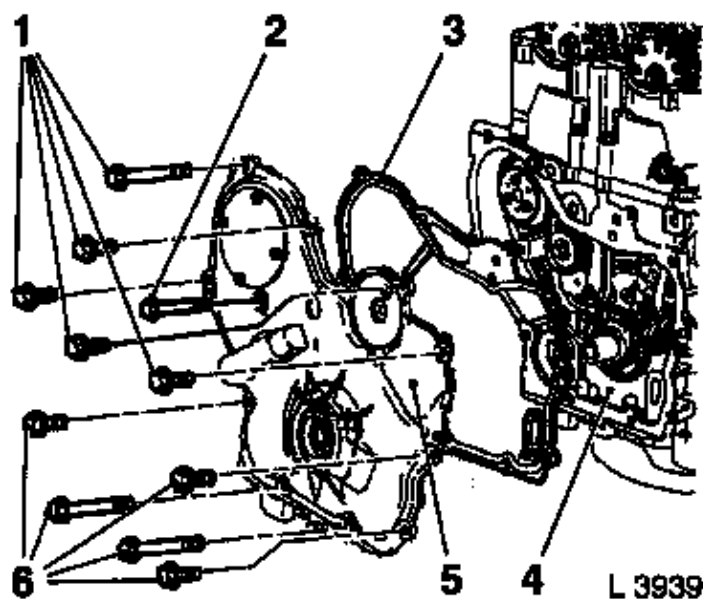
30. Undo the bolts on the right-hand engine damping block bracket.
 - 3 bolts (1)
31. Undo the bolts on the right-hand engine damping block.
 - 1 nut (arrow)
32. Take out the engine damping block bracket together with the right-hand engine damping block.



33. Undo the bolts on the timing case (5).
 - 11 bolts (2) and (3)
34. Lower the engine.
 - Work evenly, using both lifting devices.
 - Note:** It must be possible to guide the long bolt (2) of the timing case past the longitudinal member.
35. Remove the timing case.
 - Remove the gasket (3).
 - Note:** Cover the opening (4) in the timing case with a cloth.
 - Important:

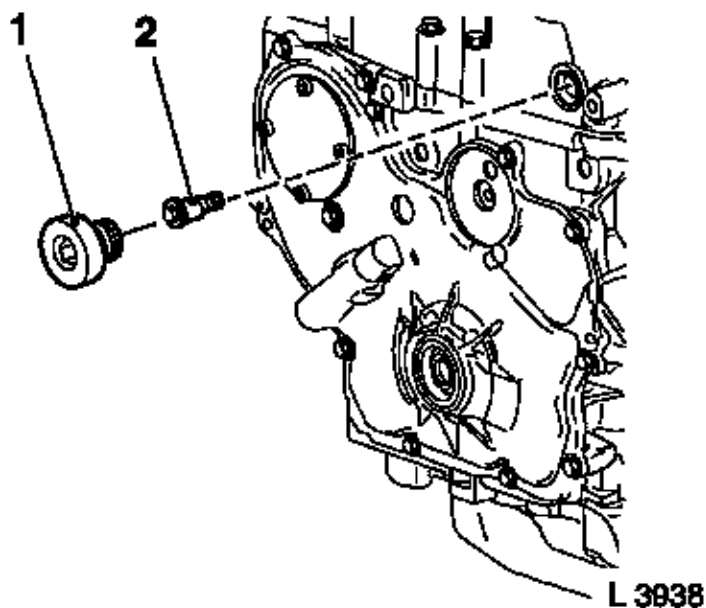
Do not damage the sealing surfaces.

- Use a suitable tool to remove the oil seal.
- Clean the sealing surfaces.



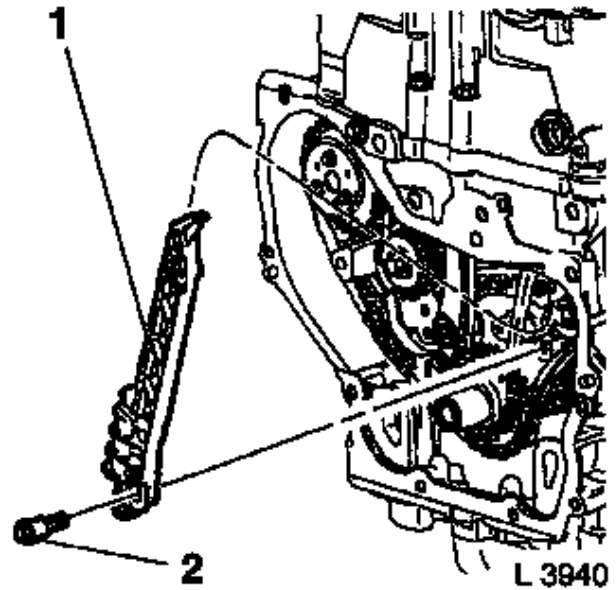
36. Unbolt the camshaft timing chain guide rail.

- Remove the screw plug (1).
- 1 bolt (2)

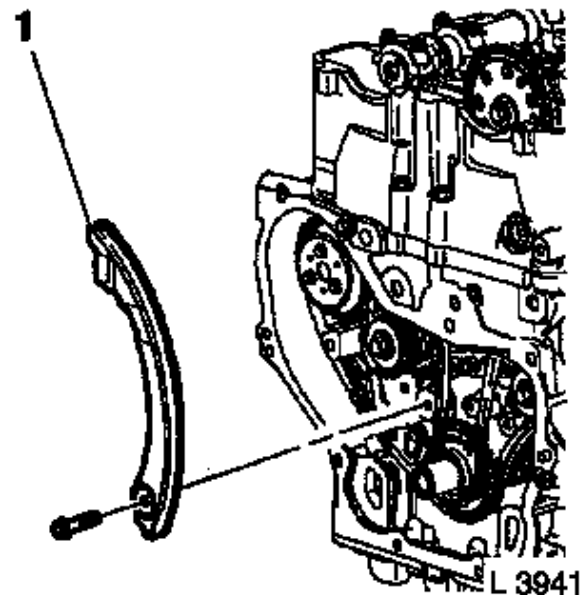


37. Remove the camshaft timing chain guide rail (1).

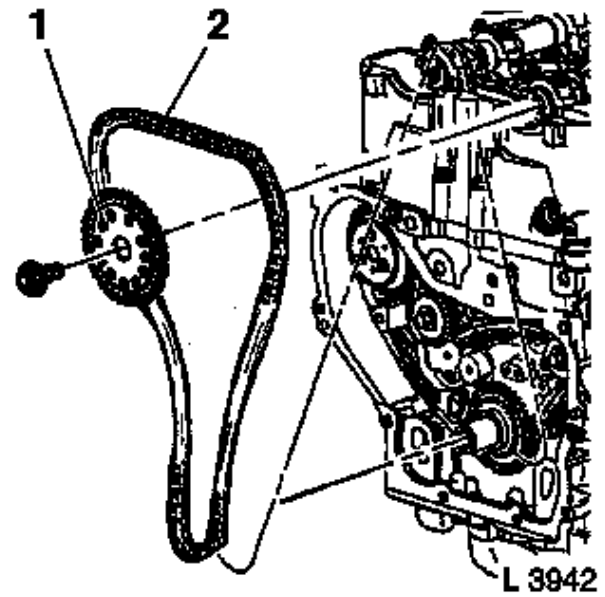
- 1 bolt (2)



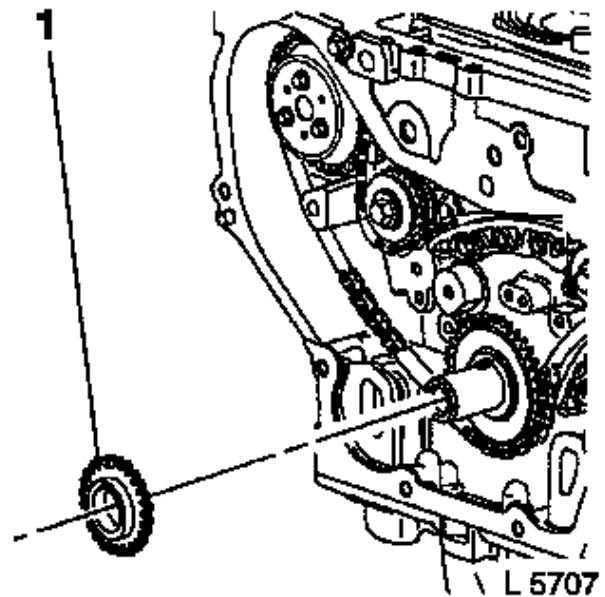
38. Remove the camshaft timing chain tensioner rail (1).
39. Raise the engine.
40. Secure the engine
 - to the rear engine damping block.
 - 1 retaining bolt
41. Lower the engine.
 - Take out **KM-904** with **KM-6054**.
42. Lower the lifting ramp.



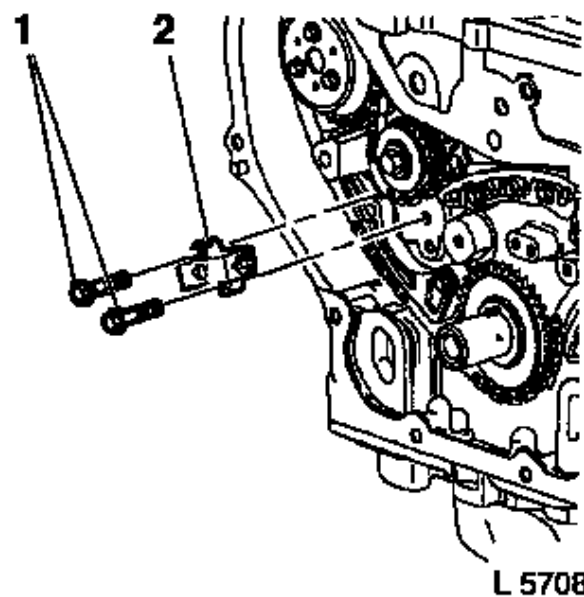
43. Remove the intake camshaft sprocket (1).
 - Hold the intake camshaft by the hexagon.
44. Take out the camshaft timing chain (2).
 - Guide the chain past the crankshaft and lift it out to the top.



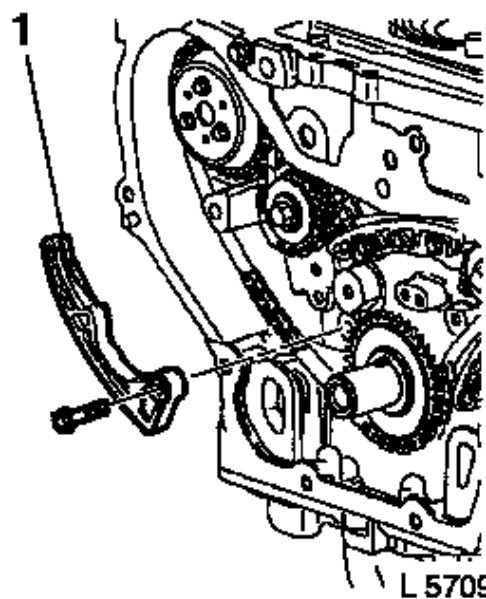
45. Take out the camshaft timing sprocket (1).



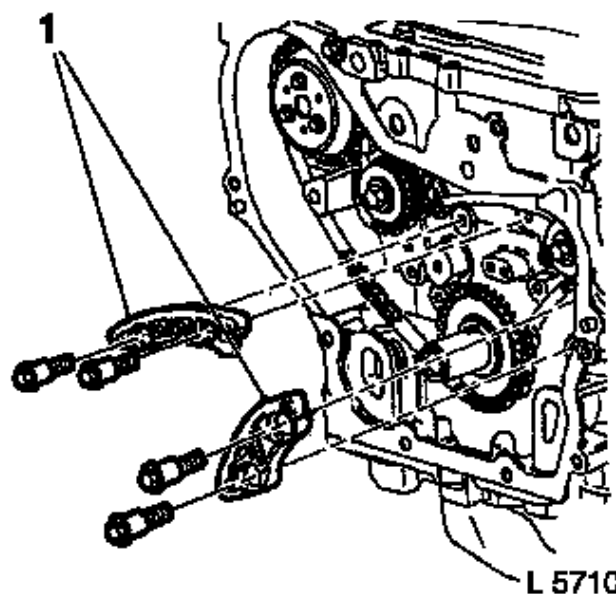
46. Remove the balancer shaft timing chain tensioner (2).
- 2 bolts (1)



47. Remove the balancer shaft timing chain tensioner rail (1).



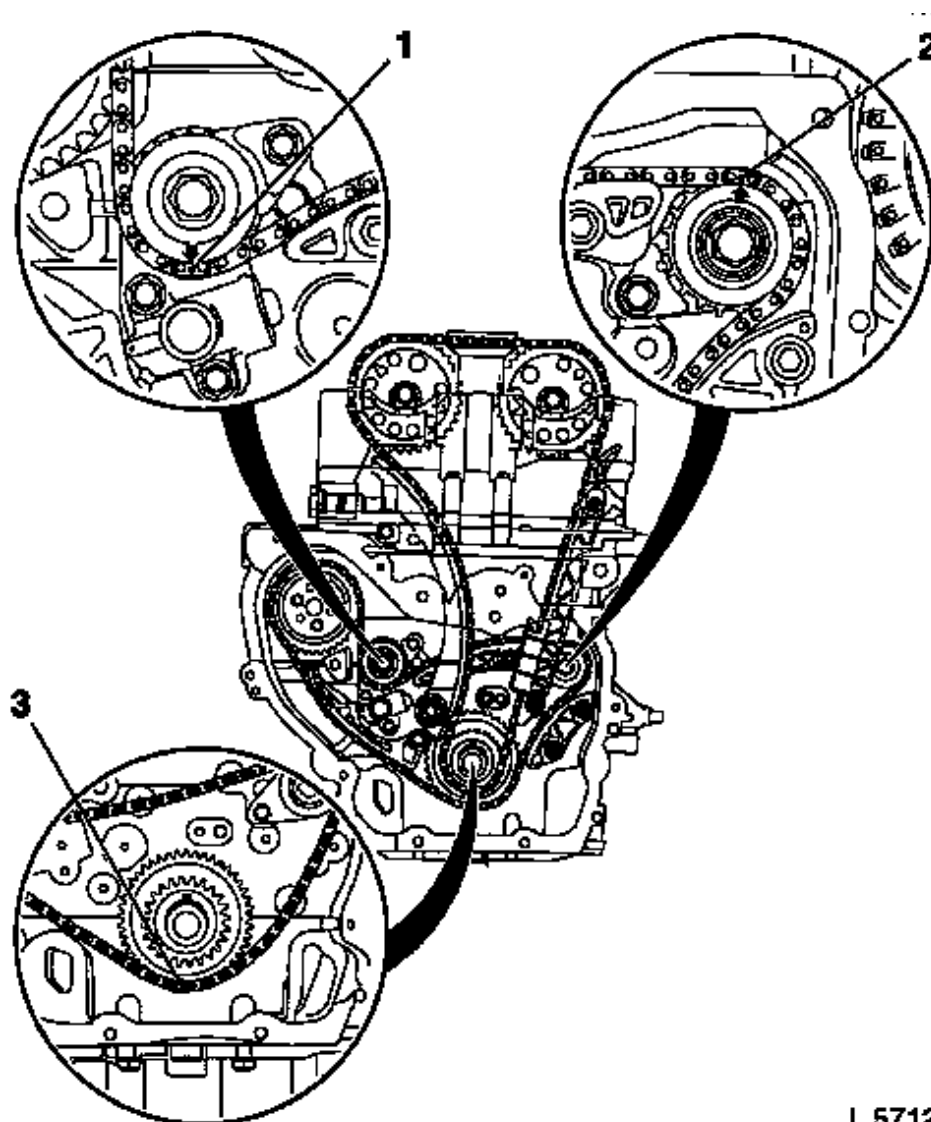
48. Remove the balancer shaft timing chain guide rails (1).
- 2 off
 - 4 bolts
49. Take out the balancer shaft timing chain.

**Install**

50. Install the balancer shaft timing chain.
- Note:** The TDC reference points on the timing chain are indicated by coloured links in the chain. These must line up with the markings on the timing sprockets.

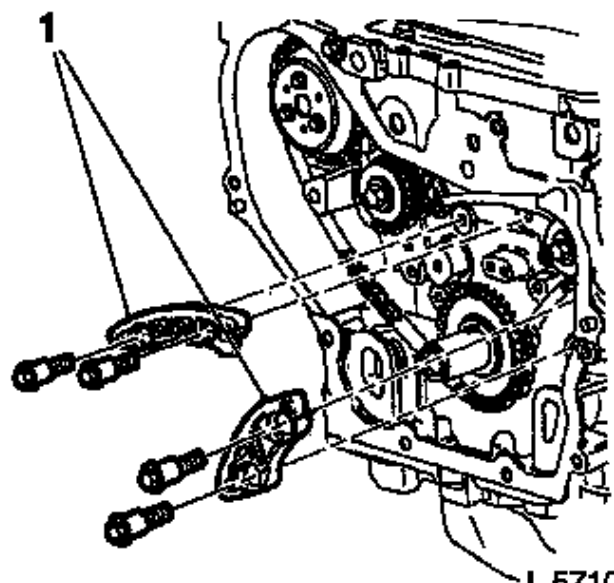
- Lay the timing chain in place.
 - Chain link (2) (copper coloured) to the marking on the balancer shaft on the intake side of the engine.
 - Secure the chain link (3) with a plastic wedge at the marking on the balancer shaft timing chain sprocket.
 - Chain onto coolant pump sprocket

- Chain link (1) to the marking on the balancer shaft on the exhaust side of the engine.



L 5712

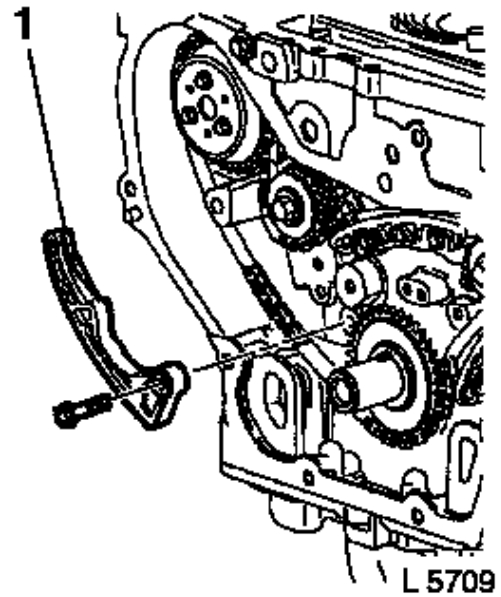
51. Install the balancer shaft timing chain guide rails (1).
- Tightening torque **10 Nm**



L 5710

52. Install the balancer shaft timing chain tensioner rail (1).

- Tightening torque **10 Nm**

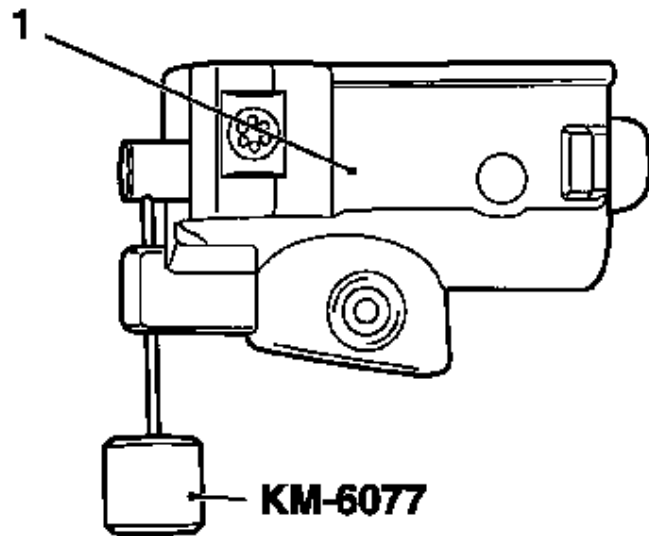


53. Install the balancer shaft timing chain tensioner.

- Lock the chain tensioner (1) with **KM-6077**.
 - Rotate the piston clockwise, press it in and insert **KM-6077** into the designated bores.
- Tightening torque **10 Nm**
- Take out **KM-6077**.
- Remove the plastic wedge.

Important: After a single revolution of the engine the TDC markings will no longer line up with the coloured chain links.

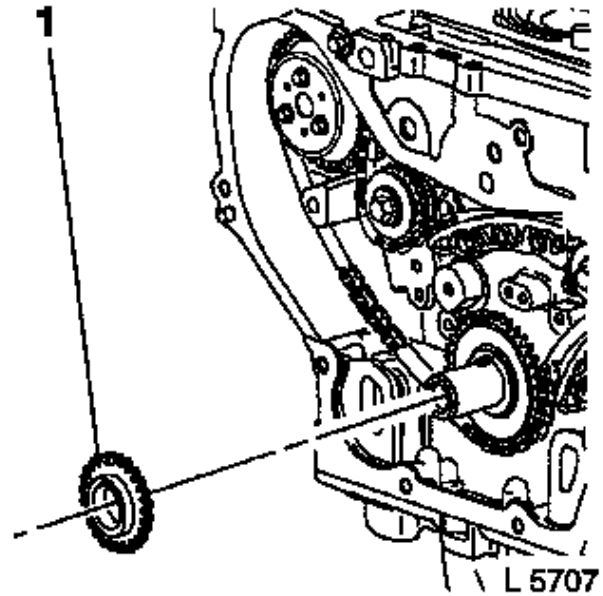
- If the TDC markings no longer line up with the coloured chain links – refit the balancer shaft timing chain.



54. Insert the camshaft timing sprocket (1).

Note: Note the correct installation position.

55. Lower the lifting ramp.

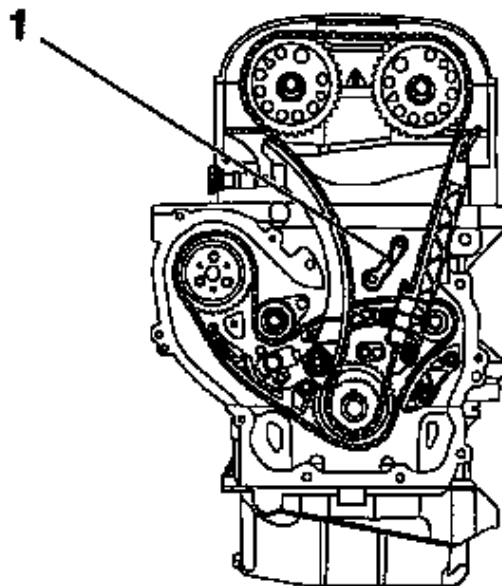


56. Insert the camshaft timing chain.

Note: Working from the top left and right, insert the timing chain past the central web (1).

57. Install the intake camshaft sprocket.

- Lay the camshaft timing chain onto the camshaft sprocket.
- Use a new bolt.
- Hold the intake camshaft by the hexagon.
 - Tightening torque **85 Nm + 30° + 15°**



58. Fit the camshaft timing chain.

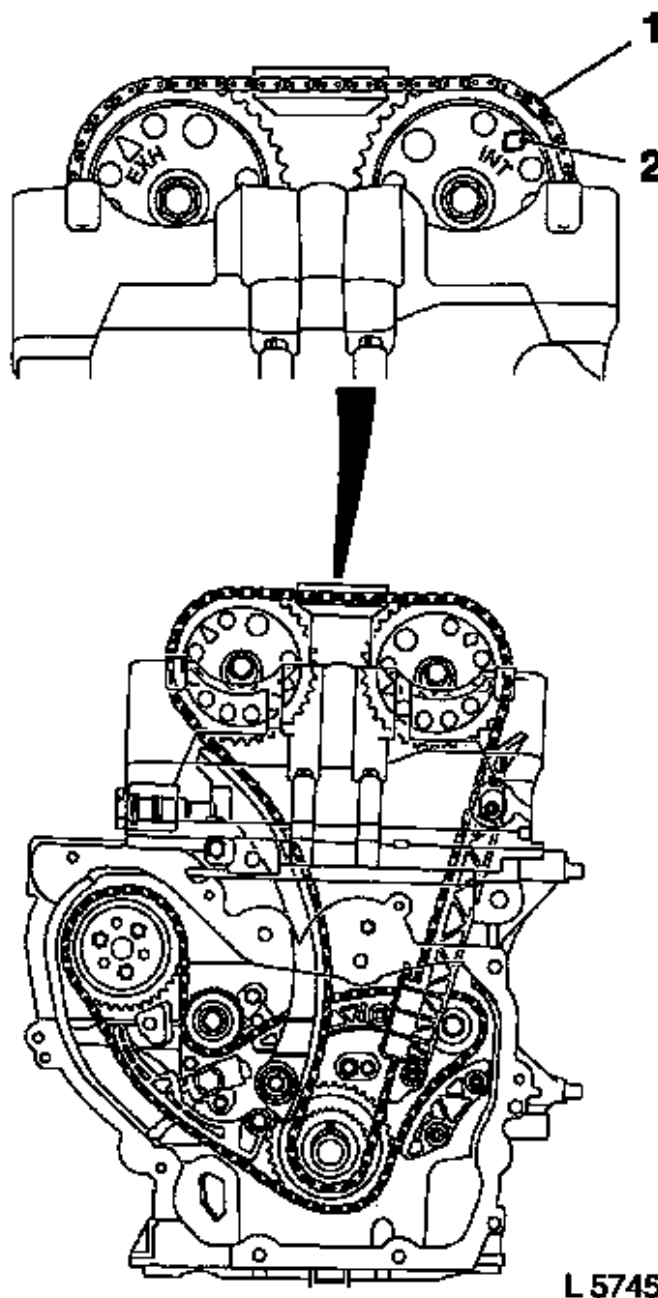
Important: The TDC reference points on the timing chain are indicated by coloured links in the chain. These must line up with the markings on the timing sprockets.

- Chain link (copper colour) (1) to INT marking (2) on the intake camshaft sprocket

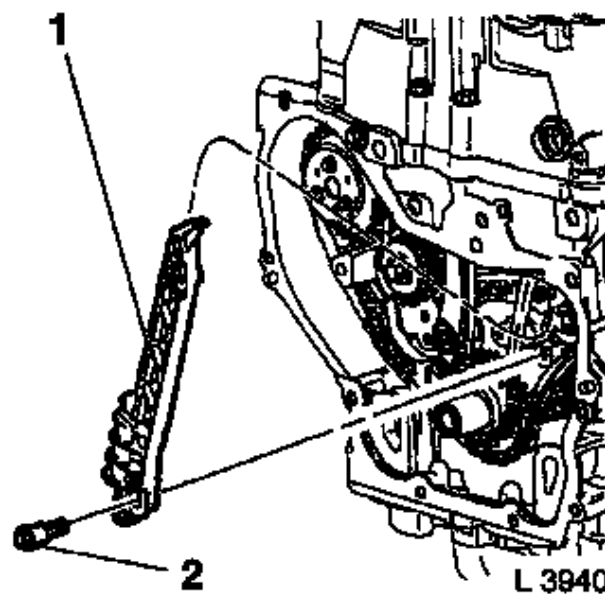
59. Raise the lifting ramp.

60. Install the camshaft timing chain tensioner rail.

- Tightening torque **10 Nm**



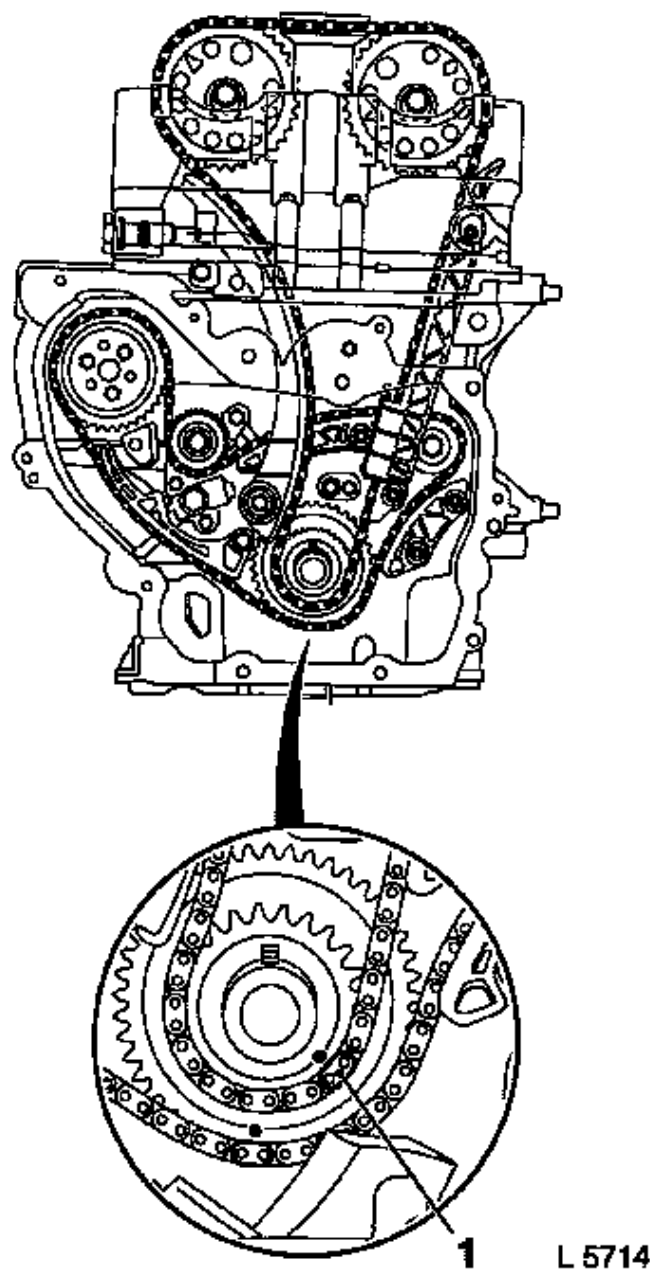
61. Install the camshaft timing chain guide rail (1).
- 1 bolt (2)
 - Tightening torque **10 Nm**



62. Secure the camshaft timing chain.

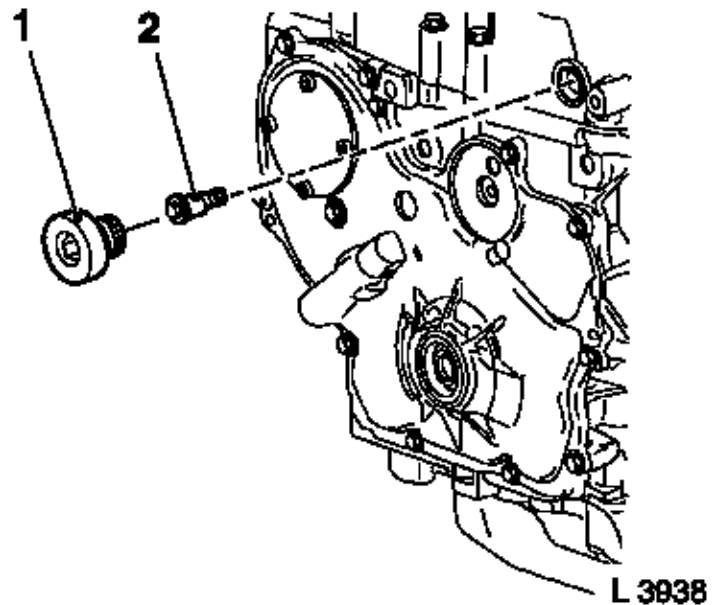
Important: Check that the TDC reference points line up.

- Secure the chain link (1) with a plastic wedge at the marking on the camshaft timing chain sprocket



63. Install the camshaft timing chain guide rail.

- 1 bolt (2)
 - Tightening torque **10 Nm**
- Install the screw plug (1).
 - Tightening torque **65 Nm**



64. Install the exhaust camshaft sprocket.

Important: Check that the TDC reference points line up.

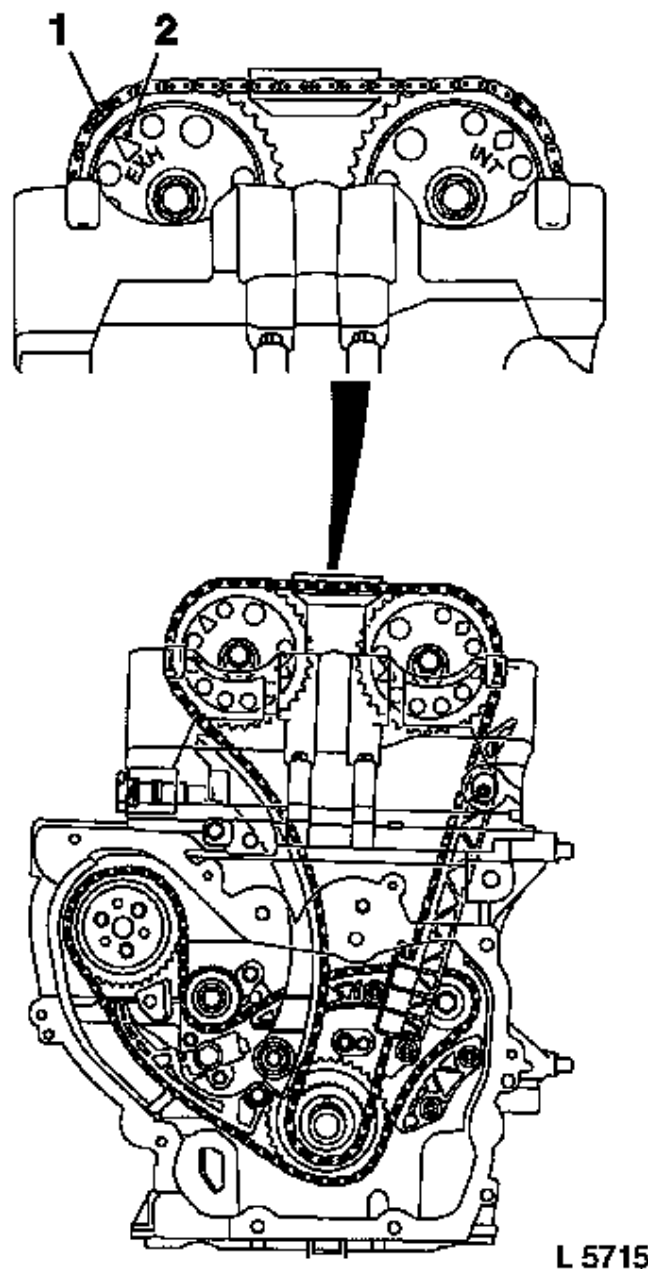
- Chain link (1) to EXH marking (2) on the exhaust camshaft sprocket
- Rotate the exhaust camshaft by the hexagon until the exhaust camshaft sprocket is seated in the guide.
- Use a new bolt.
- Hold the camshaft by the hexagon.
 - Tightening torque **85 Nm + 30° + 15°**

65. Recut the thread.

- 2 off

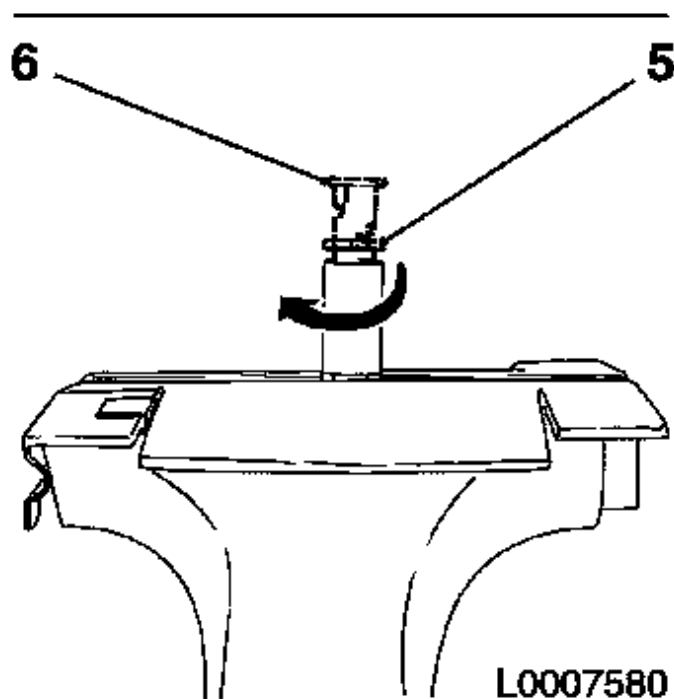
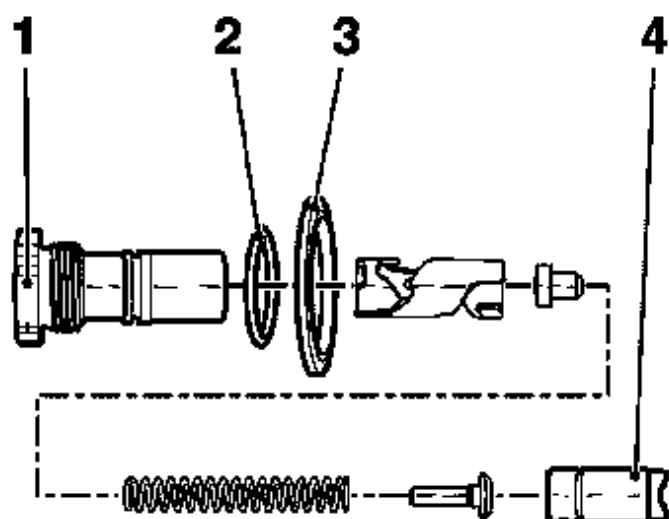
66. Install the guide rail.

- Coat the bolts with thread locking compound (red) and insert them.
 - Tightening torque **8 Nm**



67. Install the camshaft timing chain tensioner.

- Pull out the piston (4) from the housing (1).
 - Clamp the piston at the square into a vice.
 - Turn clockwise to lock the internal piston (6) in the last latch position (5).
 - Insert the piston into the housing.
- Use new oil seals (2) and (3).
- Tightening torque **75 Nm**



L0007580

Important: Failure to follow this instruction could cause the camshaft timing chain to jump.

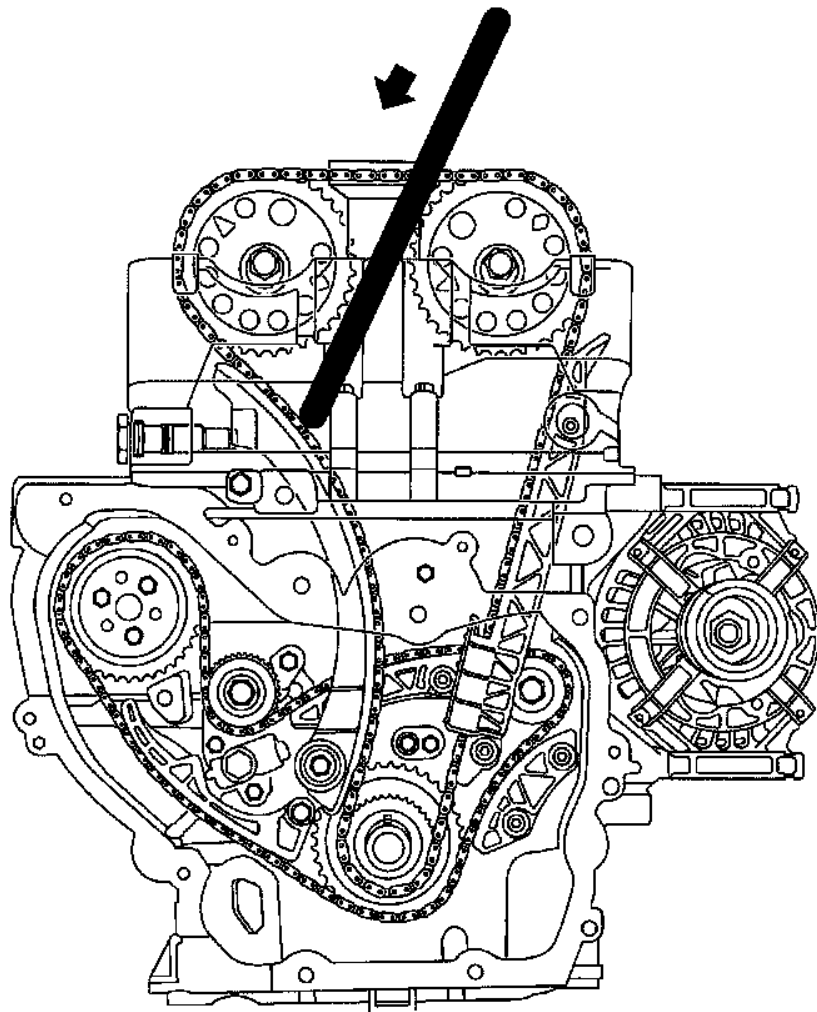
68.

Release the camshaft timing chain tensioner by pressing on the tensioner rail or the camshaft timing chain (using a blunt tool – e.g. a rounded assembly lever).

Note: If the TDC markings no longer line up with the

coloured chain links, refit the camshaft timing chain. Once the crankshaft has been rotated another turn they will no longer line up.

69. Raise the lifting ramp.
70. Support the engine from underneath with **KM-904** together with **KM-6054**.
71. Remove the retaining bolt from the engine damping block.
 - 1 retaining bolt
72. Lower the engine.

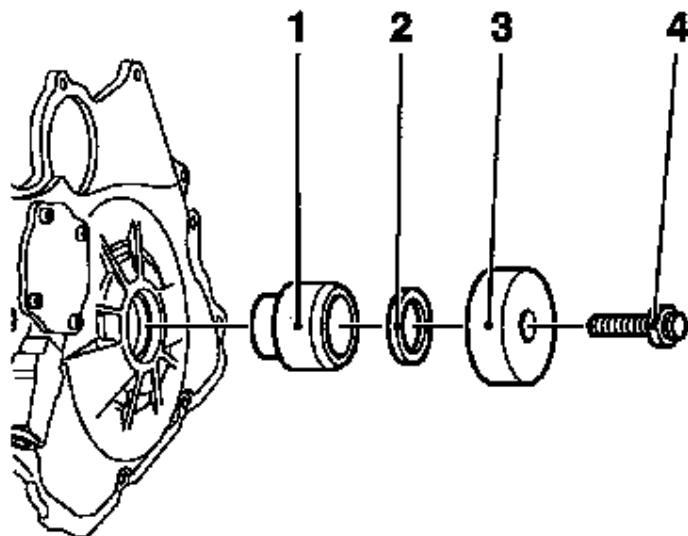


J 0935

73. Install the timing case.

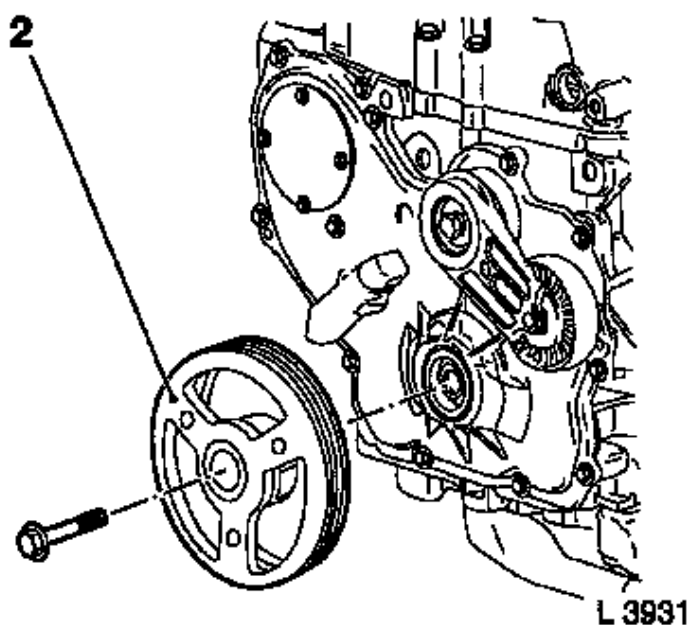
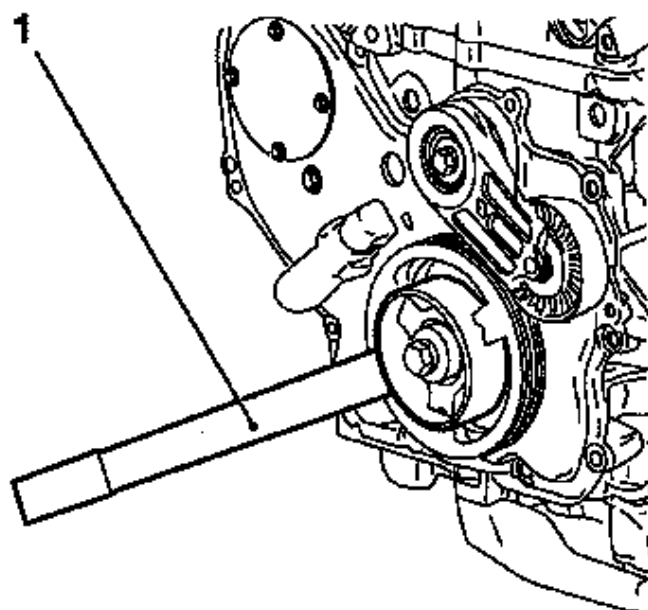
Note: Remove the plastic wedge and the cloth from the opening in the timing case.

 - Use a new gasket.
 - Tightening torque **21 Nm**
 - Install a new crankshaft front oil seal (2).
 - Slide protective sleeve (1) from **KM-6105** (3) onto the connecting rod journal.
 - Coat the sealing lips with silicone grease (white).
 - Slide the oil seal over the protective sleeve onto the connecting rod journal.
 - Use **KM-6105** to press the oil seal into the timing case.
 - Use bolt (4) of the rotational vibration damper.
 - Take out **KM-6105**.



L 3952

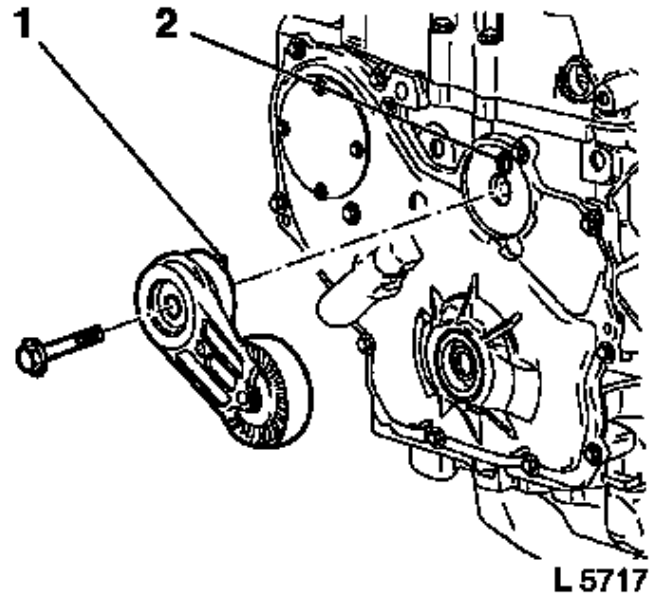
74. Raise the engine.
75. Insert the right-hand engine damping block together with the right-hand engine damping block bracket.
76. Attach the right-hand engine damping block.
 - 1 nut
 - Tightening torque **45 Nm**
77. Attach the right-hand engine damping block bracket.
 - 3 bolts
 - Tightening torque **85 Nm**
78. Attach the rear engine damping block.
 - 1 bolt, 1 nut
 - Tightening torque **86 Nm**
79. Lower the engine.
 - Take out **KM-904** with **KM-6054**.
80. Attach the bracket for the gearshift cables.
 - To the transmission
 - 1 bolt
 - Tightening torque **22 Nm**
81. Attach the rotational vibration damper (2).
 - Use holding adapter **KM-J-38122-A** in conjunction with **KM-956-1** (1) to hold.
 - Use a new bolt.
 - Tightening torque **100 Nm + 75° + 15°**



82. Attach the ribbed V-belt tensioner.

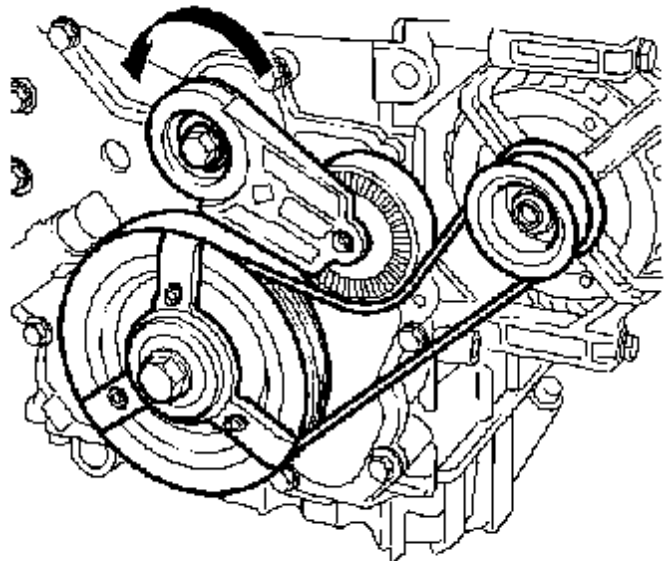
Note: The lug (1) of the ribbed V-belt tensioner engages into the bore in the timing case (2).

- Tightening torque **43 Nm**



83. Install the ribbed V-belt.

- Lay the ribbed V-belt in place.
Note: Note the running direction and installation position of the ribbed V-belt.
- Tension the ribbed V-belt tensioner in the direction of the arrow with **KM-6151**.



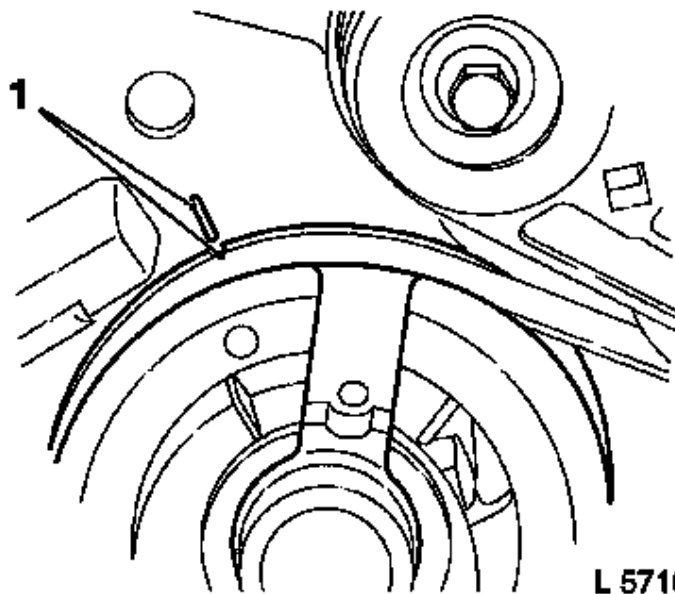
84. Rotate the crankshaft **720°**.

- Rotate the crankshaft in the normal direction of rotation to TDC on cylinder no. 4 (marking 1).
Note: In this position the cams (1) and (2) of cylinder no. 4 point upwards.

85. Install the front exhaust pipe.

- Use new gaskets.
- 6 nuts, 3 bolts
 - Tightening torque **16 Nm**
- Hook into the mountings.

86. Install the lower engine splash shield
- 13 bolts
87. Lower the lifting ramp.

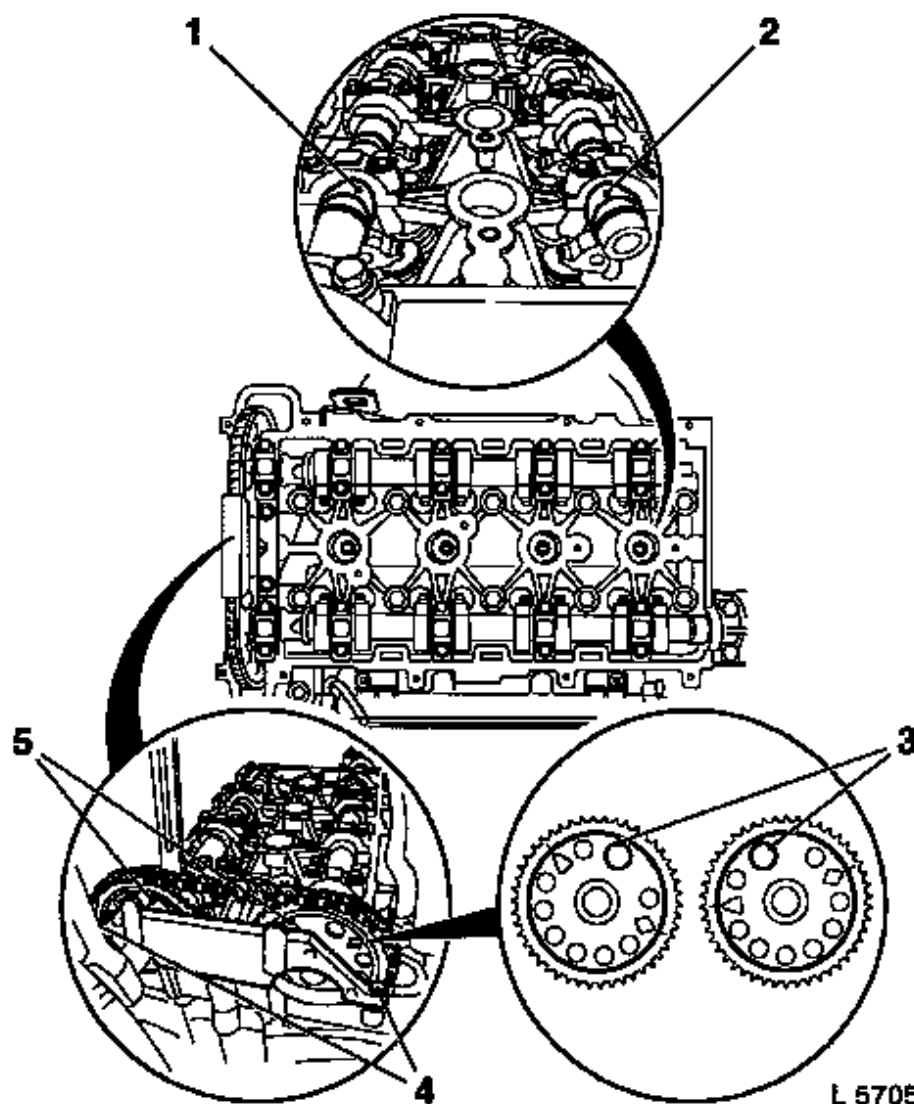


88. Attach **KM-6148**.

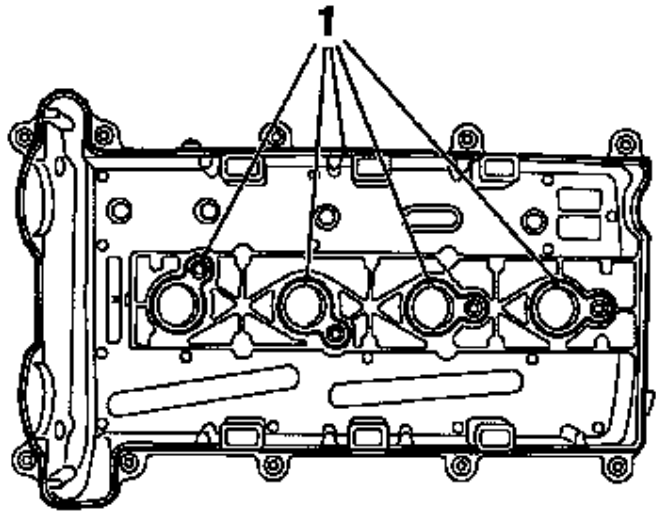
Note: In this position the cams (1) and (2) of cylinder no. 4 point upwards.

- Attach **KM-6148** with the enclosed bolts (4).
- Slide the positioning bolts (5) into the designated bores (3) on the camshaft sprockets.

89. Detach **KM-6148**.



90. Attach the cylinder head cover
- Clean the sealing surfaces.
 - Use new gaskets.
- Note:** The sealing lips of the seals (1) must be inserted into the groove on the cylinder head cover.
- Tightening torque **9 Nm**
- Attach the ground cable
 - Tightening torque **9 Nm**
 - Attach the engine lifting eyes.
 - 2 bolts, 1 nut
 - Attach the engine breather hose.
 - Attach the fuel line bracket.
 - Tightening torque **8 Nm**
91. Attach the ignition module.
- Tightening torque **9 Nm**
 - Attach and secure the wiring harness connector.

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92. Connect the fuel lines.
- 2 union nuts
 - Tightening torque **10 Nm**
 - Fuel line bracket
 - 2 bolts
 - Tightening torque **9 Nm**
93. Install the engine cover.
- Check the alignment.
 - 6 bolts, tightening torque **14 Nm**
94. Close the engine cover.
95. Connect the battery.
96. Close the bonnet.
97. Reprogram the volatile memories.