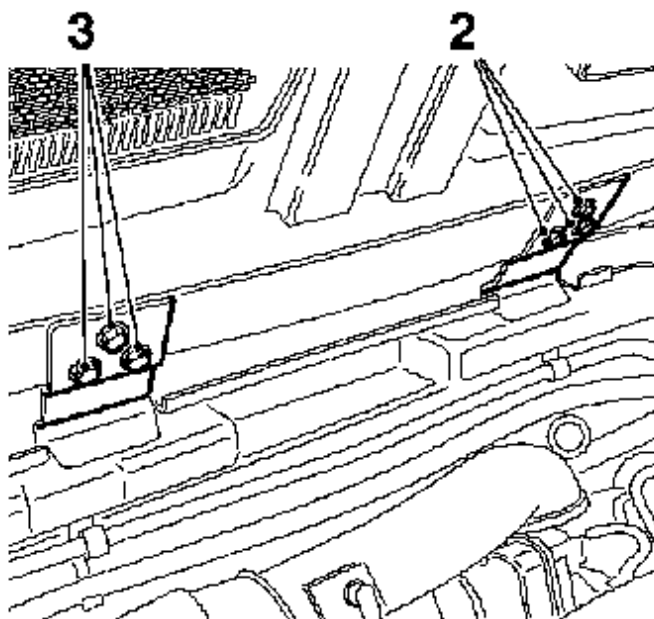
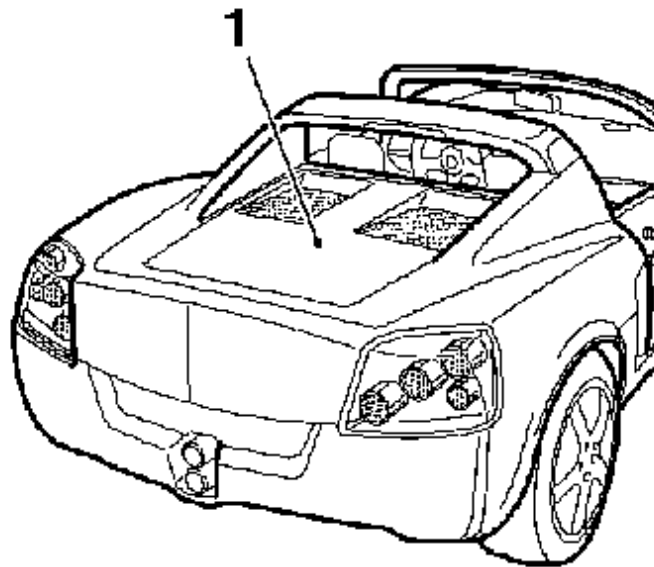


## Valve Stem Seals, Replace (Z 22 SE)



**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)

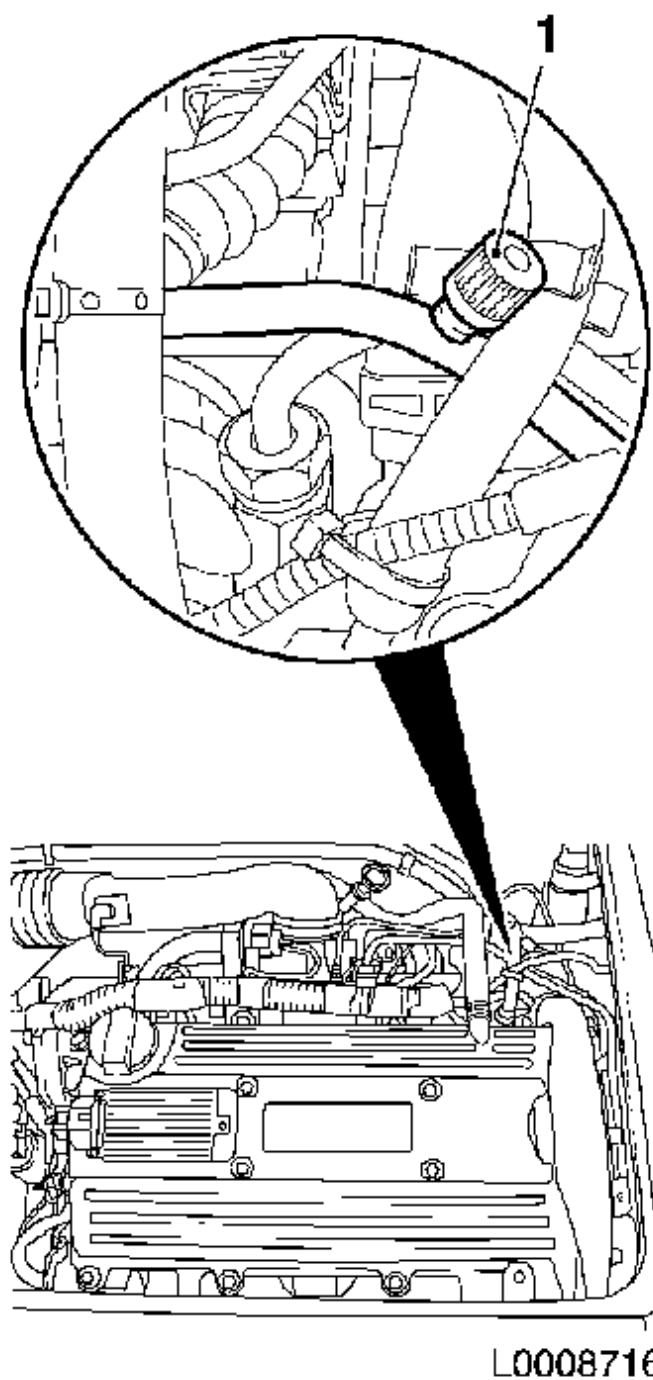


L0008715

5. Release the fuel pressure.
 

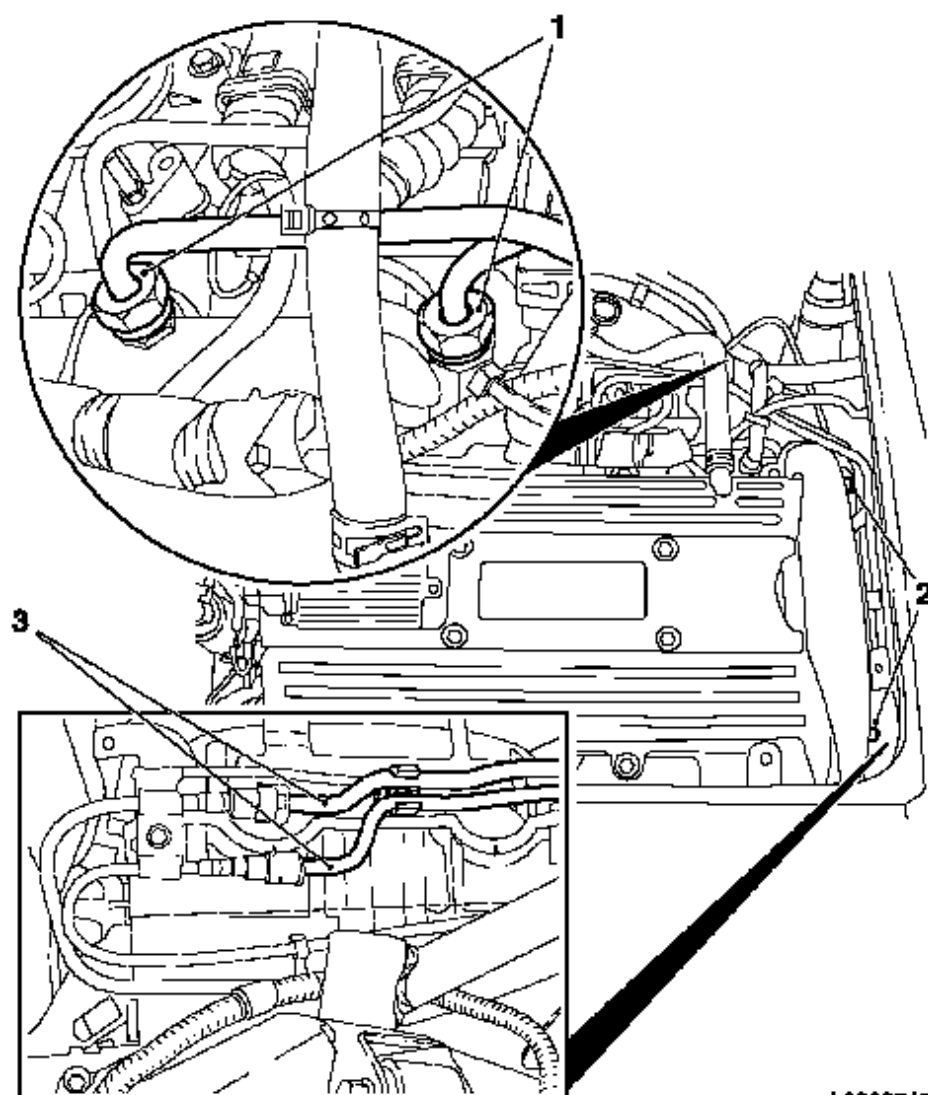
**Important:** Fuel may escape – observe the safety regulations and relevant national legislation.

  - Release the fuel pressure with the pressure tester **KM-J-34730-91** (1) via test connection (2).
    - Collect any escaping fuel in a suitable container.



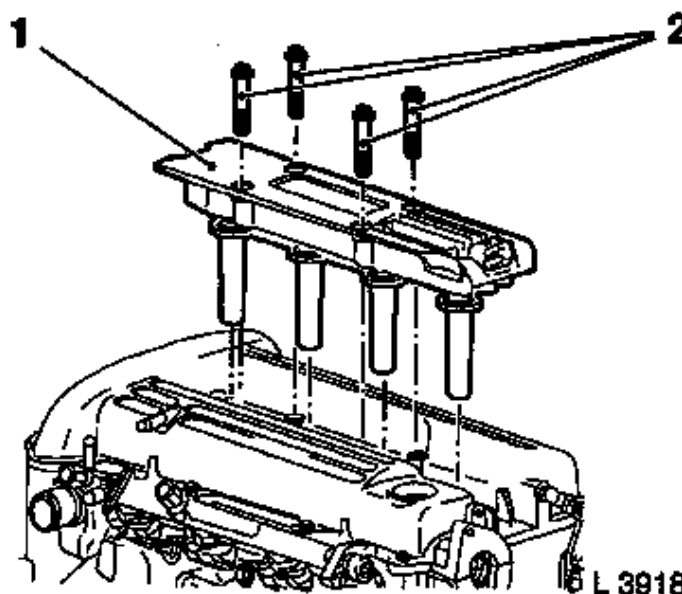
L0008716

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



L0008717

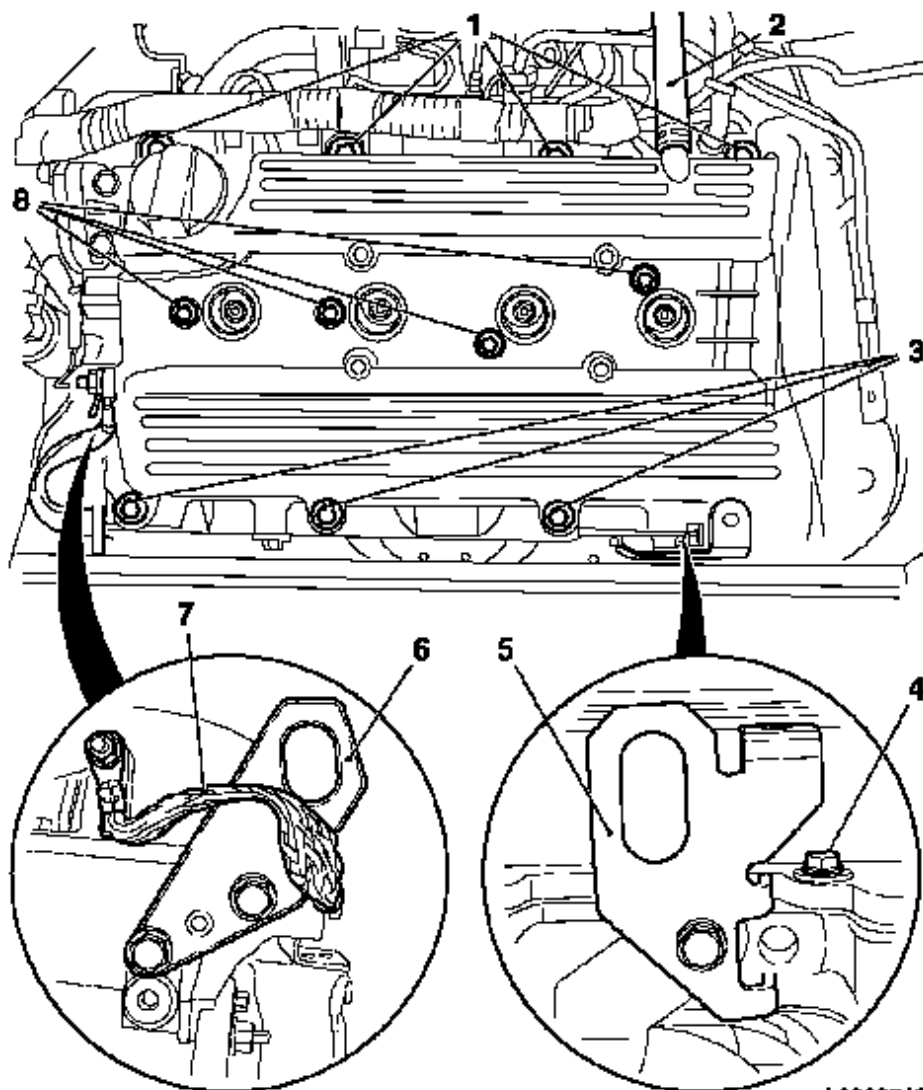
7. Detach the ignition module (1).
- Release and detach the wiring harness connector.
  - 4 bolts (2)



L 3918

**8. Remove the cylinder head cover.**

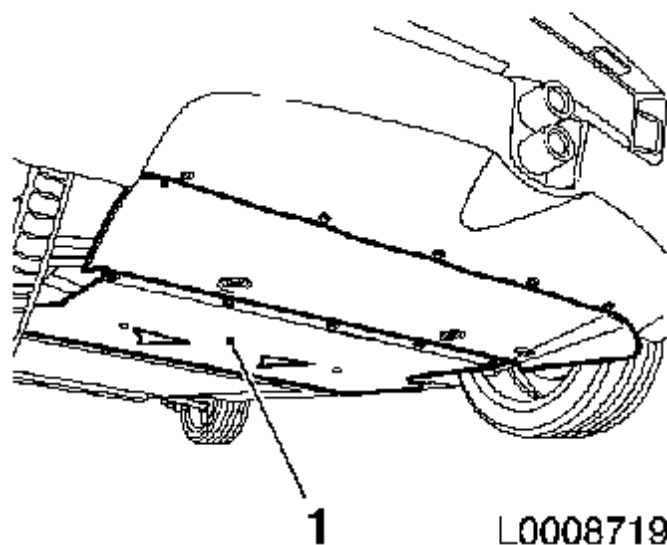
- Detach the engine breather hose (2).
- Detach the engine lifting eyes (5) and (6).
  - 2 bolts, 1 nut
- Detach the ground cable (7).
  - 1 bolt
- 12 bolts (1), (3), (4) and (8)
- Raise the lifting ramp.



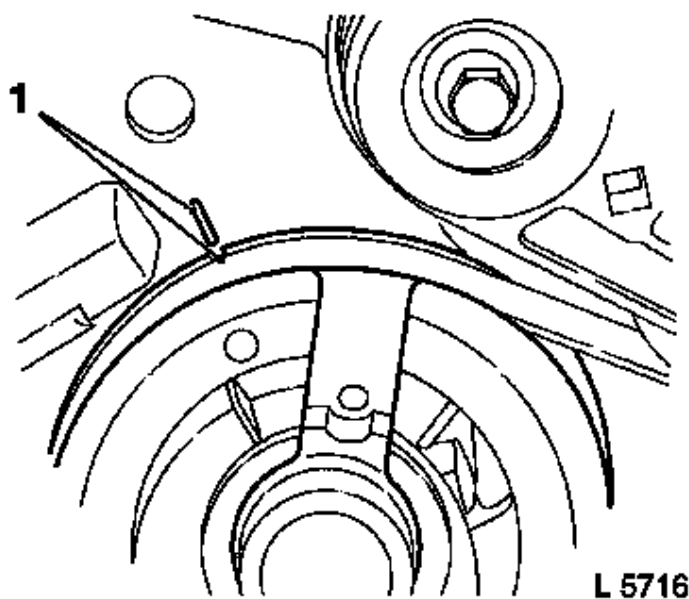
**9. Remove the lower engine splash shield (1).**

- 13 bolts

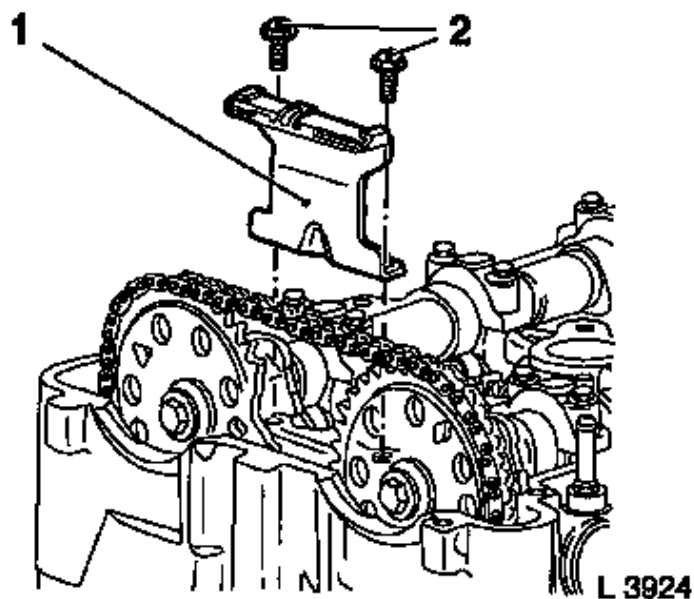
L0008718



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

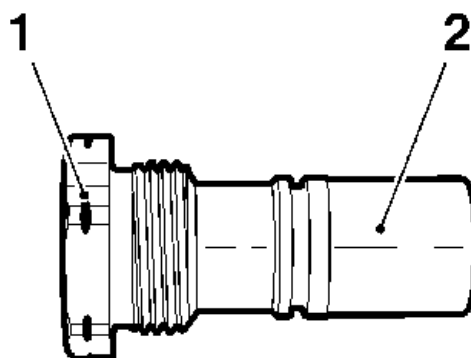


12. Remove the guide rail (1).
  - 2 bolts (2)



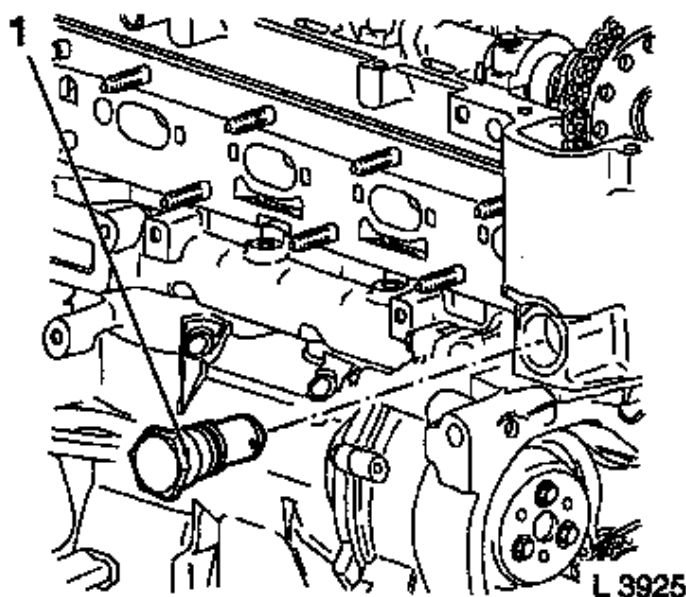
**13. Note:**

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

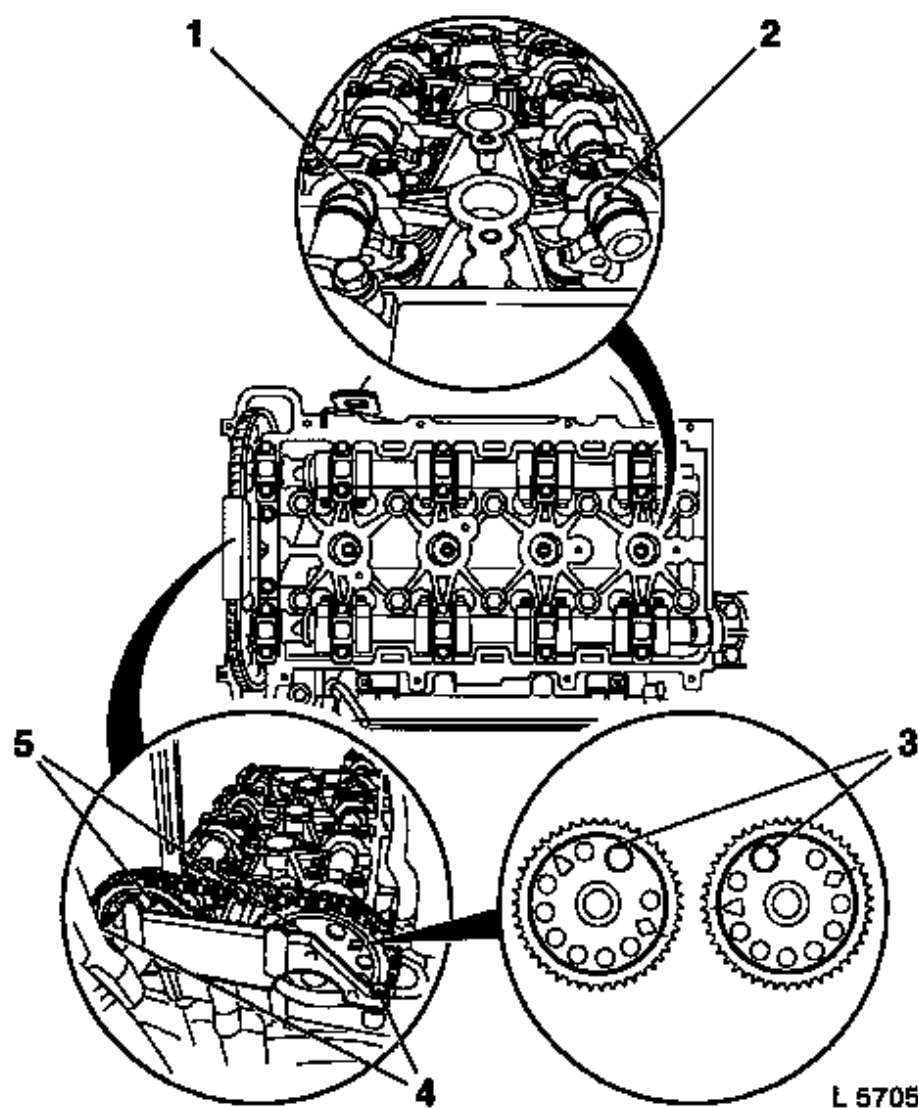
- 14.** Remove the camshaft timing chain tensioner (1).



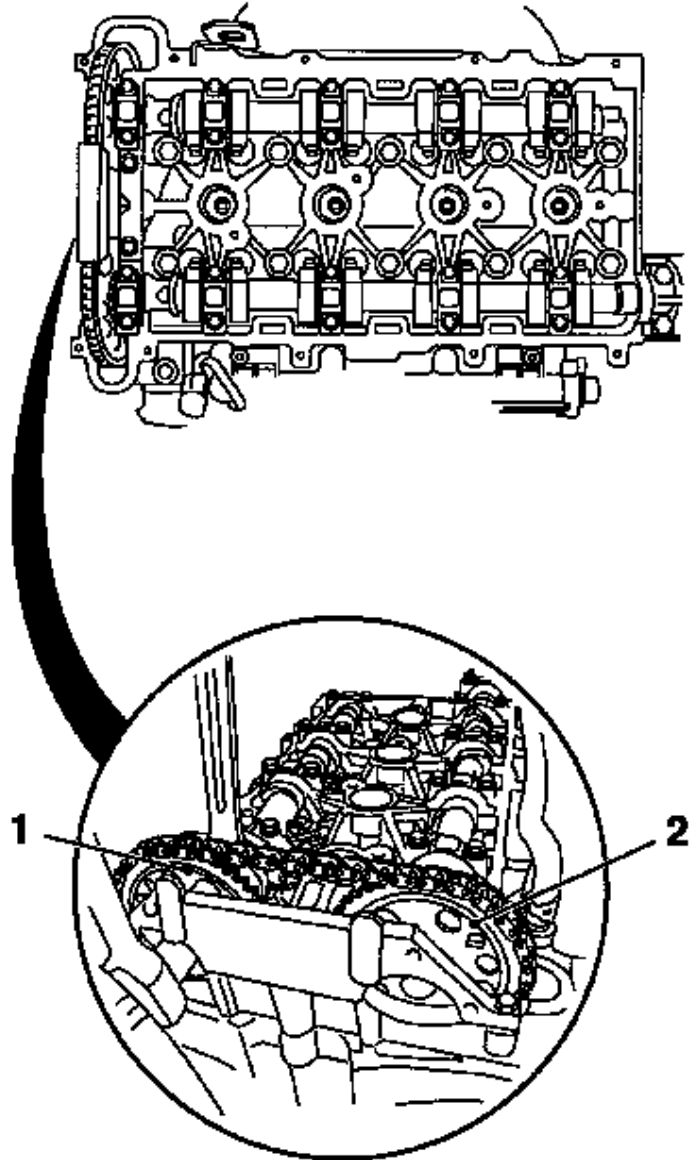
15. Attach **KM-6148**.

**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.



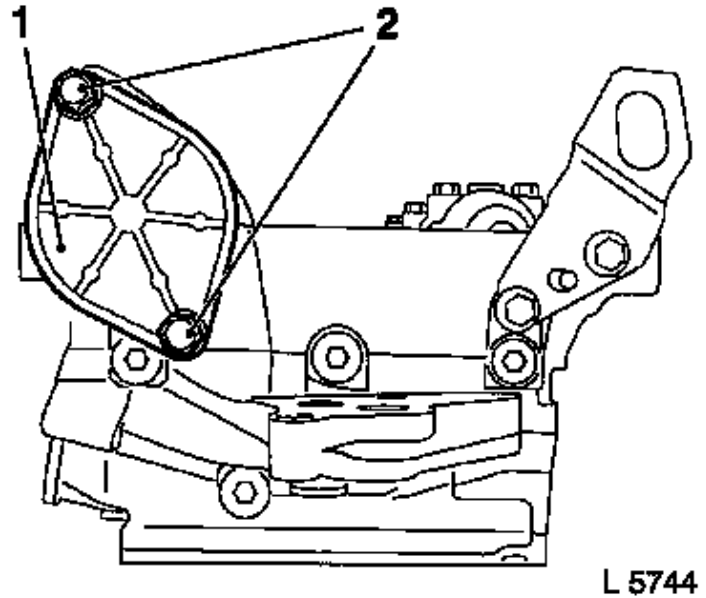
16. Detach the exhaust camshaft sprocket (1).
  - Hold the exhaust camshaft by the hexagon.
  - Pull back the positioning bolt to release.
17. Detach the intake camshaft sprocket (2).
  - Hold the intake camshaft by the hexagon.



L 6072

18. Detach the camshaft connecting flange cover (1).
  - 2 bolts (2)





19. Remove the intake camshaft.

- Remove the camshaft bearing caps.

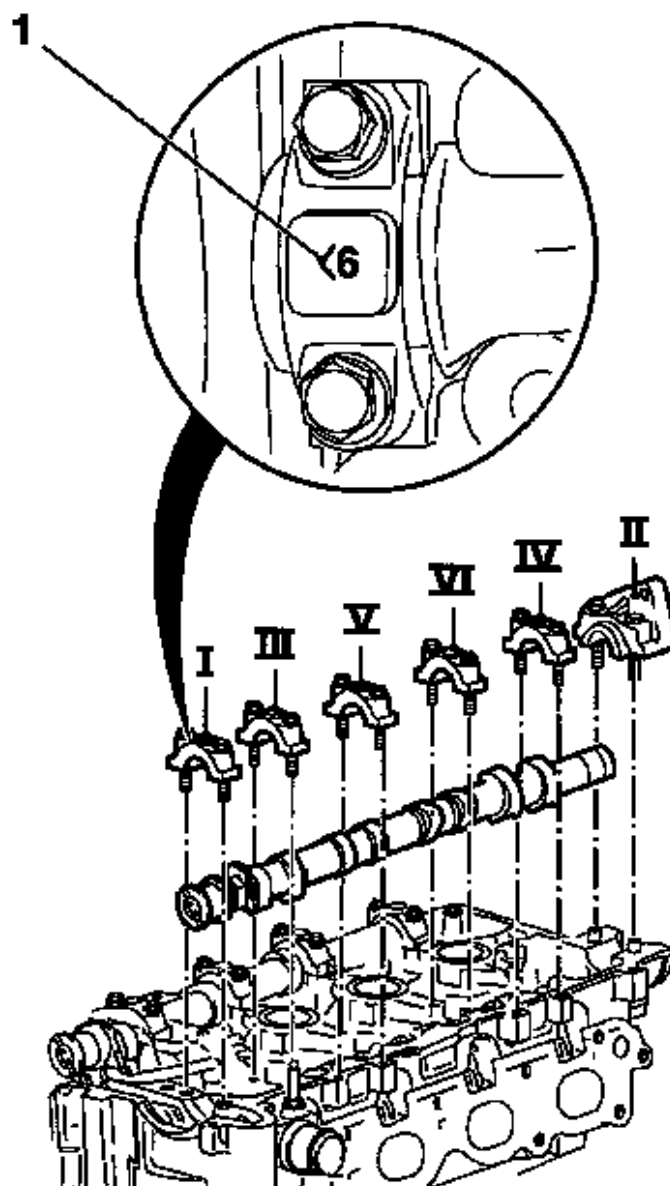
**Important:** Note identification marking (1).

- Working in a spiral pattern from the outside towards the middle, release the bolts on the camshaft bearing caps (I to VI) 1/2 to 1 turn at a time.

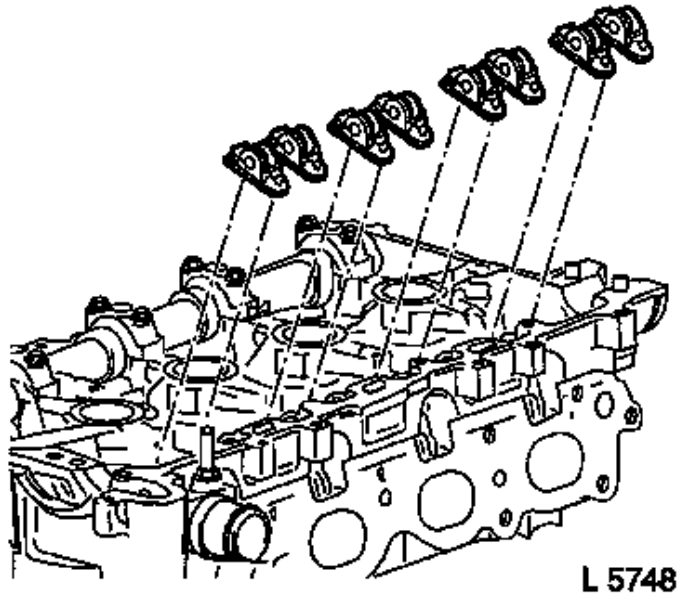
**Note:** The camshaft must be released evenly from the bearings.

- Take out the camshaft.
- Visually inspect the camshaft and the camshaft bearings for wear.

**Note:** The cylinder head should be replaced if the camshaft bearings are defective.

**L 5747**

20. Take out the roller cam followers.
- Important:** Note the correct allocation.
- 8 off



21. Remove the exhaust camshaft.

- Remove the camshaft bearing caps.

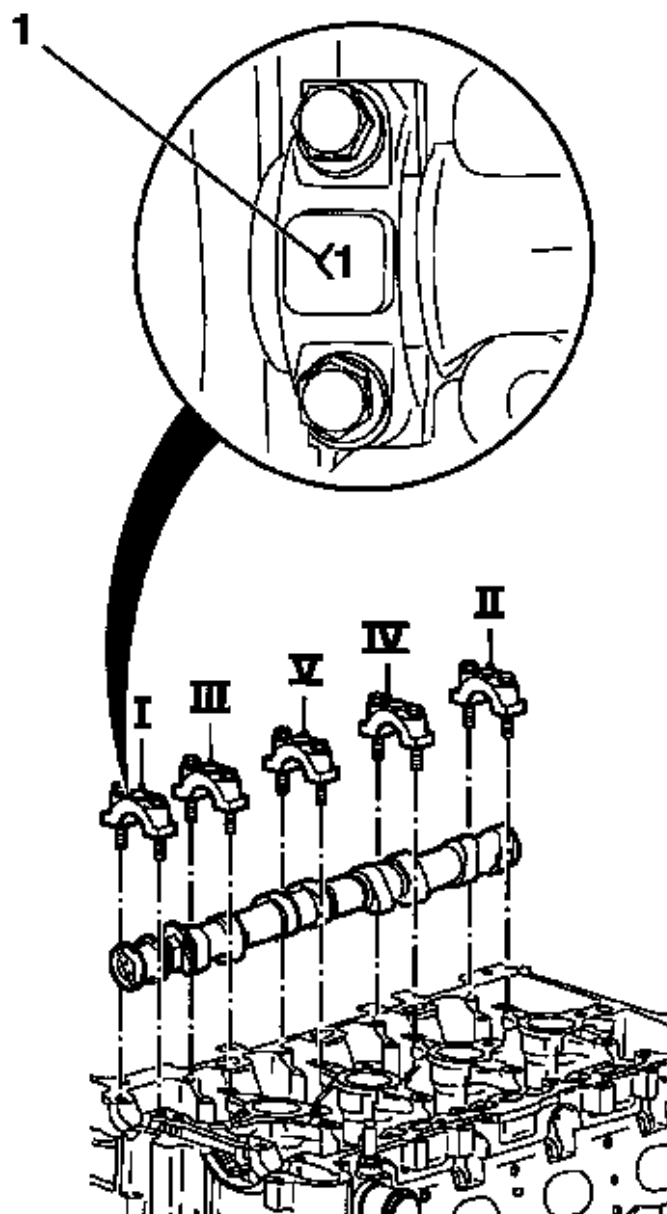
**Important:** Note identification marking (1).

- Working in a spiral pattern from the outside towards the middle, release the bolts on the camshaft bearing caps (I to V) 1/2 to 1 turn at a time.

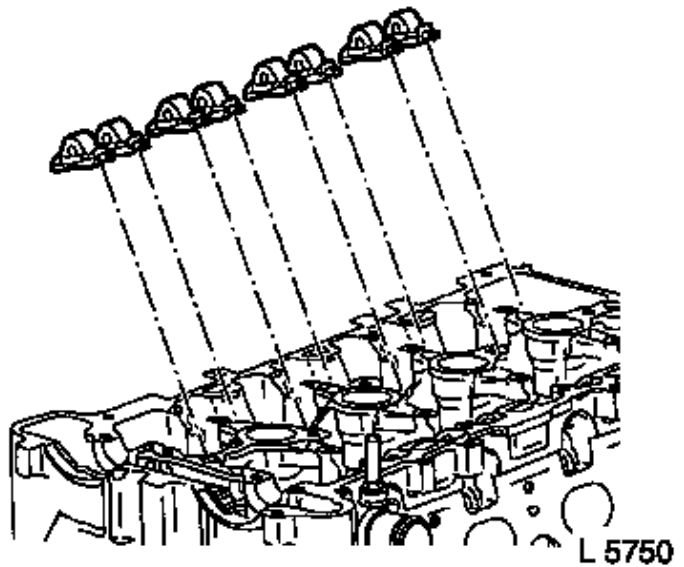
**Note:** The camshaft must be released evenly from the bearings.

- Take out the camshaft.
- Visually inspect the camshaft and the camshaft bearings for wear.

**Note:** The cylinder head should be replaced if the camshaft bearings are defective.

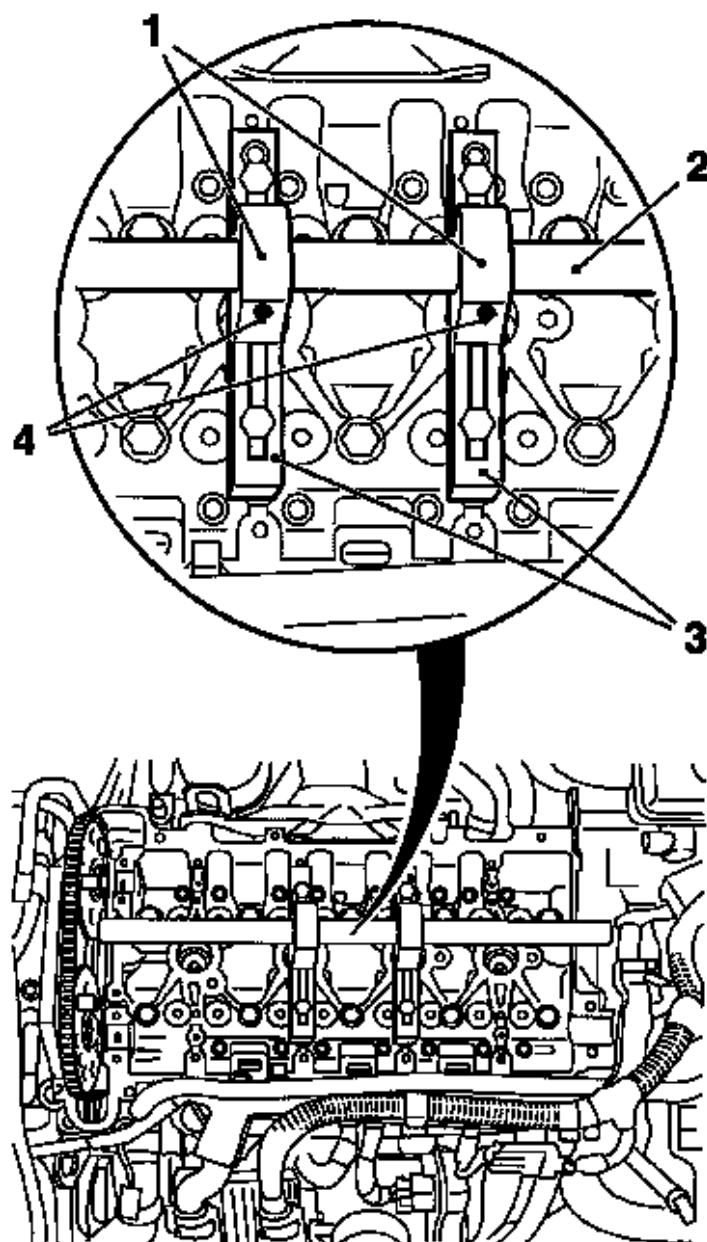
**L 5749**

22. Take out the roller cam followers.
- Important:** Note the correct allocation.
- 8 off
23. Insert the roller cam followers.
- Coat the sliding surfaces with engine oil.



**24.** Attach the supports (1).

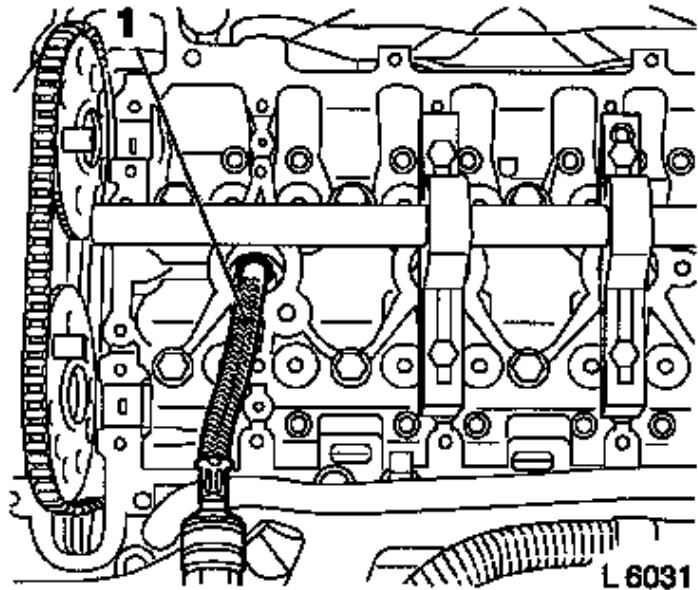
- Adjust the supports **MKM-889-11**.
  - Centrally align the support heads to the support feet (3) and tighten.
- Slide the assembly shaft **MKM-889-9** (2) into the supports.
- Position both supports with the assembly shaft on cylinders 2 and 3, align centrally over the spark plug bores and tighten.
  - 4 bolts
- Secure the assembly shaft.
  - 2 bolts (4)



L 6030

**25. Attach compressed air adapter MKM-889-17 (1).**

- Screw it into the spark plug thread of cylinder no. 1.
- Apply compressed air to cylinder no. 1.



26. Attach lever arm **MKM-889-12** (2).
  - Complete the lever arm with the joint **MKM-889-13** (1) and removal head **MKM-889-15** (3).
  - Slide the assembly onto the assembly shaft over cylinder no. 1.
 

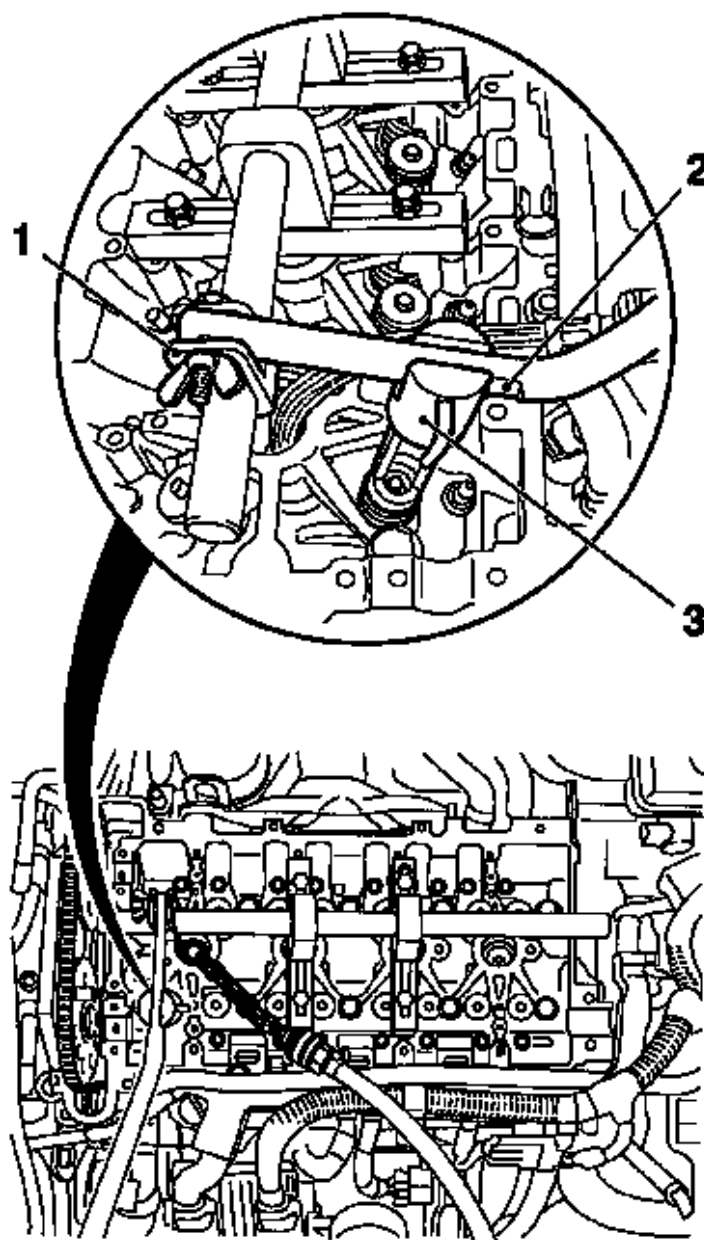
**Note:** The removal head must point towards the intake side.
27. Remove the intake valve springs on cylinder no. 1.
  - 2 off
  - Carefully press down the valve springs.
 

**Important:** The removal head must be vertical over the valve stem.

    - Use the lever arm **MKM-889-12**
  - Remove the valve collets.

**Important:** Note the correct allocation.

  - Take out the valve spring retainer and the valve springs.



L 6032

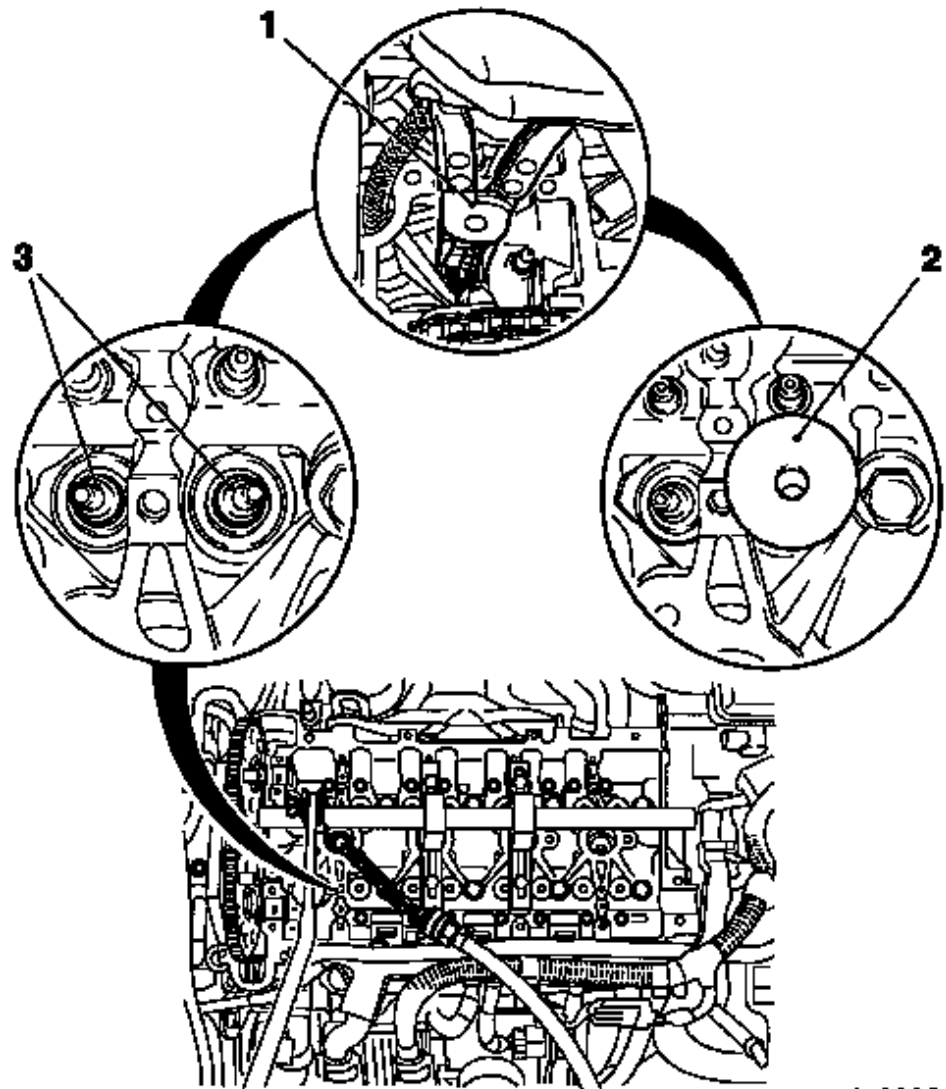
**Install**

28. Install new valve stem seals (3).
- 2 off
  - Use remover **KM-840** (1) to pull them off.
  - Coat the valve stem with engine oil.
  - Push new valve



stem seals onto the valve stem.

- Use installer **KM-6152** (2) to drive them home.



L 6033

**29.** Complete the installation head **MKM-889-2** (3).

- Insert thrust pad **MKM-889-6** (2).  
**Note:** Follow the manufacturer's instructions.

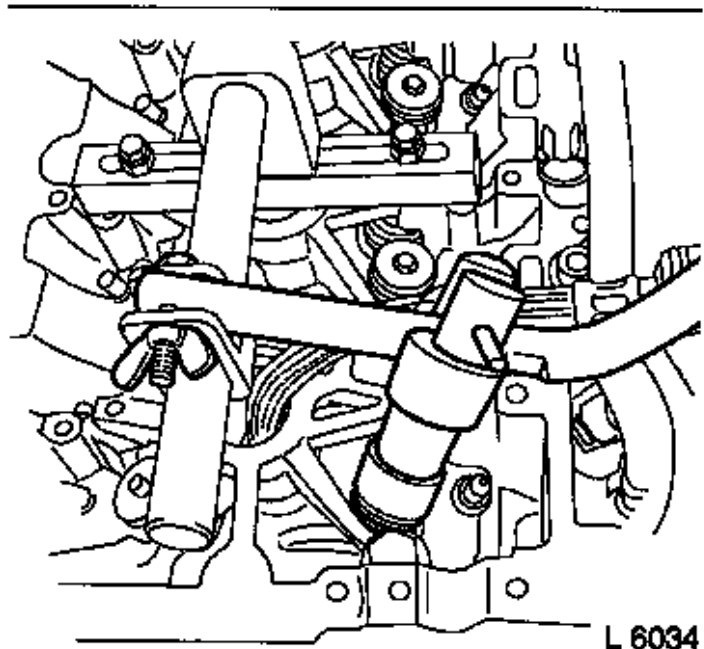
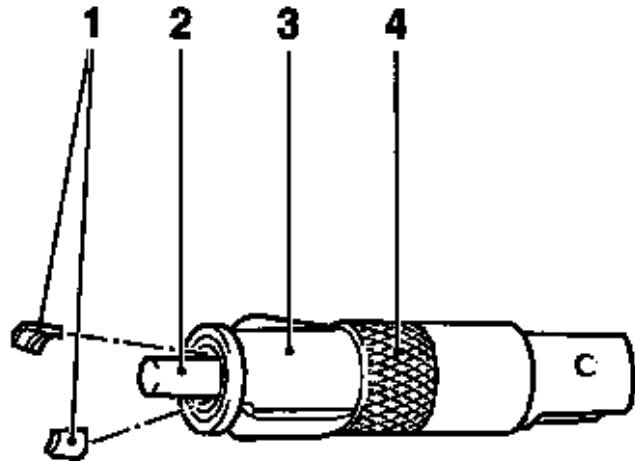
**30.** Install the intake valve springs on cylinder no 1.

- Insert the valve springs and the valve spring retainer.

**Important:** Insert the valve collets with the narrower part facing the valve.

- Insert the valve collets (1) into the installation head **MKM-889-2**.
  - Slide the plastic clamping sleeve (4) towards the lever arm mounting.
  - Slide the plastic clamping sleeve towards the valve.
- Attach the installation head to the lever arm.

- Carefully press down the valve spring.
- Important:** The installation head must be vertical over the valve stem. The valve collets must engage audibly.
- Use the lever arm **MKM-889-12**



**31.** Check the installation position.

**Important:** Do not carry out a second attempt without checking that both valve collets are seated in the installation head.

- Check the seat of the valve collets (visual inspection).

**32.** Transfer the lever arm **MKM-889-12**.

- Take out the lever arm.
- Detach the installation head.
- Attach the removal head.
- Install the lever arm.
- Note:** The removal head must point towards the exhaust side.

**33.** Remove the exhaust valve springs on cylinder no. 1.

- 2 off

- Carefully press down the valve springs.  
**Important:** The removal head must be vertical over the valve stem.
  - Use the lever arm **MKM-889-12**
- Remove the valve collets.  
**Important:** Note the correct allocation.
  - Take out the valve spring retainer and the valve springs.
- 34.** Install new valve stem seals.
  - 2 off
  - Use remover **KM-840** to pull them off.
  - Coat the valve stem with engine oil.
  - Push new valve stem seals onto the valve stem.
  - Use installer **KM-6152** to drive them home.
- 35.** Install the exhaust valve springs on cylinder no 1.
  - Insert the valve springs and the valve spring retainer.
  - Insert the valve collets into the installation head **MKM-889-2**.  
**Important:** Insert the valve collets with the narrower part facing the valve.
    - Slide the plastic clamping sleeve towards the lever arm mounting.
    - Slide the plastic clamping sleeve towards the valve.
  - Attach the installation head to the lever arm.
  - Carefully press down the valve spring.  
**Important:** The installation head must be vertical over the valve stem. The valve collets must engage audibly.
    - Use the lever arm **MKM-889-12**
- 36.** Check the installation position.  
**Important:** Do not carry out a second attempt without checking that both valve collets are seated in the installation head.
  - Check the seat of the valve collets (visual inspection).
- 37.** Transfer the compressed air adapter **MKM-889-17**.
  - Interrupt the compressed air supply.
  - Unscrew it from the spark plug thread of cylinder no. 1.
  - Screw it into the spark plug thread of cylinder no. 4.
  - Apply compressed air to cylinder no. 4.
- 38.** Transfer the lever arm **MKM-889-12**.
  - Take out the lever arm.
  - Detach the installation head.
  - Attach the removal head.
  - Slide the assembly onto the assembly shaft over cylinder no. 4.  
**Note:** The removal head must point towards the exhaust side.
- 39.** Remove the exhaust valve springs on cylinder no. 4.
  - 2 off
  - Carefully press down the valve springs.  
**Important:** The removal head must be vertical over the valve stem.
    - Use the lever arm **MKM-889-12**
  - Remove the valve collets.  
**Important:** Note the correct allocation.
    - Take out the valve spring retainer and the valve springs.
- 40.** Install new valve stem seals.
  - 2 off

- Use remover **KM-840** to pull them off.
  - Coat the valve stem with engine oil.
  - Push new valve stem seals onto the valve stem.
  - Use installer **KM-6152** to drive them home.
- 41.** Install the exhaust valve springs on cylinder no 4.
- Insert the valve springs and the valve spring retainer.
  - Insert the valve collets into the installation head **MKM-889-2**.
    - Slide the plastic clamping sleeve towards the lever arm mounting.
  - Important:** Insert the valve collets with the narrower part facing the valve.
    - Slide the plastic clamping sleeve towards the valve.
  - Attach the installation head to the lever arm.
  - Carefully press down the valve spring.
    - Important:** The installation head must be vertical over the valve stem. The valve collets must engage audibly.
    - Use the lever arm **MKM-889-12**
- 42.** Check the installation position.
- Important:** Do not carry out a second attempt without checking that both valve collets are seated in the installation head.
  - Check the seat of the valve collets (visual inspection).
- 43.** Transfer the lever arm **MKM-889-12**.
- Take out the lever arm.
  - Detach the installation head.
  - Attach the removal head.
  - Install the lever arm.
  - Note:** The removal head must point towards the intake side.
- 44.** Remove the intake valve springs on cylinder no. 4.
- 2 off
  - Carefully press down the valve springs.
    - Important:** The removal head must be vertical over the valve stem.
    - Use the lever arm **MKM-889-12**
  - Remove the valve collets.
    - Important:** Note the correct allocation.
  - Take out the valve spring retainer and the valve springs.
- 45.** Install new valve stem seals.
- 2 off
  - Use remover **KM-840** to pull them off.
  - Coat the valve stem with engine oil.
  - Push new valve stem seals onto the valve stem.
  - Use installer **KM-6152** to drive them home.
- 46.** Install the intake valve springs on cylinder no 4.
- Insert the valve springs and the valve spring retainer.
  - Insert the valve collets into the installation head **MKM-889-2**.
    - Slide the plastic clamping sleeve towards the lever arm mounting.
  - Important:** Insert the valve collets with the narrower part facing the valve.
    - Slide the plastic clamping sleeve towards the valve.
  - Attach the installation head to the lever arm.
  - Important:** The installation head must be vertical over the valve stem. The valve collets must engage audibly.

- Carefully press down the valve spring.
  - Use the lever arm **MKM-889-12**
- 47. Check the installation position.
 

**Important:** Do not carry out a second attempt without checking that both valve collets are seated in the installation head.

  - Check the seat of the valve collets (visual inspection).
- 48. Detach the compressed air adapter **MKM-889-17**.
  - Interrupt the compressed air supply.
  - Unscrew it from the spark plug thread of cylinder no. 4.
- 49. Detach the lever arm **MKM-889-12**.
- 50. Transfer the supports.
  - Release the assembly shaft.
  - Detach both supports together with the assembly shaft.
  - Detach the installation head and attach the removal head.
  - Slide the lever arm onto the assembly shaft.
  - Position both supports with the assembly shaft and the lever arm on cylinders 1 and 4, align centrally over the spark plug bores and tighten.
    - 4 bolts
  - Secure the assembly shaft.
    - 2 bolts
- 51. Attach the compressed air adapter **MKM-889-17**.
  - Screw it into the spark plug thread of cylinder no. 2.
  - Apply compressed air to cylinder no. 2.
- 52. Remove the intake valve springs on cylinder no. 2.
  - 2 off
  - Carefully press down the valve springs.
 

**Important:** The removal head must be vertical over the valve stem.

    - Use the lever arm **MKM-889-12**
  - Remove the valve collets.
 

**Important:** Note the correct allocation.

    - Take out the valve spring retainer and the valve springs.
- 53. Install new valve stem seals.
  - 2 off
  - Use remover **KM-840** to pull them off.
  - Coat the valve stem with engine oil.
  - Push new valve stem seals onto the valve stem.
  - Use installer **KM-6152** to drive them home.
- 54. Install the intake valve springs on cylinder no 2.
  - Insert the valve springs and the valve spring retainer.
  - Insert the valve collets into the installation head **MKM-889-2**.
    - Slide the plastic clamping sleeve towards the lever arm mounting.

**Important:** Insert the valve collets with the narrower part facing the valve.

    - Slide the plastic clamping sleeve towards the valve.
  - Attach the installation head to the lever arm.
  - Carefully press down the valve spring.
 

**Important:** The installation head must be vertical over the valve stem. The valve collets must engage audibly.

    - Use the lever arm **MKM-889-12**

55. Check the installation position.  
**Important:** Do not carry out a second attempt without checking that both valve collets are seated in the installation head.  
• Check the seat of the valve collets (visual inspection).
56. Transfer the lever arm **MKM-889-12**.  
• Take out the lever arm.  
• Detach the installation head.  
• Attach the removal head.  
• Install the lever arm.  
**Note:** The removal head must point towards the exhaust side.
57. Remove the exhaust valve springs on cylinder no. 2.  
• 2 off  
• Carefully press down the valve springs.  
**Important:** The removal head must be vertical over the valve stem.  
– Use the lever arm **MKM-889-12**  
• Remove the valve collets.  
**Important:** Note the correct allocation.  
• Take out the valve spring retainer and the valve springs.
58. Install new valve stem seals.  
• 2 off  
• Use remover **KM-840** to pull them off.  
• Coat the valve stem with engine oil.  
• Push new valve stem seals onto the valve stem.  
• Use installer **KM-6152** to drive them home.
59. Install the exhaust valve springs on cylinder no 2.  
• Insert the valve springs and the valve spring retainer.  
• Insert the valve collets into the installation head **MKM-889-2**.  
– Slide the plastic clamping sleeve towards the lever arm mounting.  
**Important:** Insert the valve collets with the narrower part facing the valve.  
– Slide the plastic clamping sleeve towards the valve.  
• Attach the installation head to the lever arm.  
• Carefully press down the valve spring.  
**Important:** The installation head must be vertical over the valve stem. The valve collets must engage audibly.  
– Use the lever arm **MKM-889-12**
60. Check the installation position.  
**Important:** Do not carry out a second attempt without checking that both valve collets are seated in the installation head.  
• Check the seat of the valve collets (visual inspection).
61. Transfer the compressed air adapter **MKM-889-17**.  
• Interrupt the compressed air supply.  
• Unscrew it from the spark plug thread of cylinder no. 2.  
• Screw it into the spark plug thread of cylinder no. 3.  
• Apply compressed air to cylinder no. 3.
62. Transfer the lever arm **MKM-889-12**.  
• Take out the lever arm.  
• Detach the installation head.  
• Attach the removal head.  
**Note:** The removal head must point towards the exhaust side.

63. Remove the exhaust valve springs on cylinder no. 3.
- 2 off
  - Carefully press down the valve springs.  
**Important:** The removal head must be vertical over the valve stem.
    - Use the lever arm **MKM-889-12**
  - Remove the valve collets.  
**Important:** Note the correct allocation.
  - Take out the valve spring retainer and the valve springs.
64. Install new valve stem seals.
- 2 off
  - Use remover **KM-840** to pull them off.
  - Coat the valve stem with engine oil.
  - Push new valve stem seals onto the valve stem.
  - Use installer **KM-6152** to drive them home.
65. Install the exhaust valve springs on cylinder no 3.
- Insert the valve springs and the valve spring retainer.
  - Insert the valve collets into the installation head **MKM-889-2**.
    - Slide the plastic clamping sleeve towards the lever arm mounting.**Important:** Insert the valve collets with the narrower part facing the valve.
    - Slide the plastic clamping sleeve towards the valve.
  - Attach the installation head to the lever arm.
  - Carefully press down the valve spring.  
**Important:** The installation head must be vertical over the valve stem. The valve collets must engage audibly.
    - Use the lever arm **MKM-889-12**
66. Check the installation position.
- Important:** Do not carry out a second attempt without checking that both valve collets are seated in the installation head.
- Check the seat of the valve collets (visual inspection).
67. Transfer the lever arm **MKM-889-12**.
- Take out the lever arm.
  - Detach the installation head.
  - Attach the removal head.
  - Install the lever arm.  
**Note:** The removal head must point towards the intake side.
68. Remove the intake valve springs on cylinder no. 3.
- 2 off
  - Carefully press down the valve springs.  
**Important:** The removal head must be vertical over the valve stem.
    - Use the lever arm **MKM-889-12**
  - Remove the valve collets.  
**Important:** Note the correct allocation.
  - Take out the valve spring retainer and the valve springs.
69. Install new valve stem seals.
- 2 off
  - Use remover **KM-840** to pull them off.
  - Coat the valve stem with engine oil.
  - Push new valve stem seals onto the valve stem.

- Use installer **KM-6152** to drive them home.
- 70.** Install the intake valve springs on cylinder no 3.
- Insert the valve springs and the valve spring retainer.
  - Insert the valve collets into the installation head **MKM-889-2**.
    - Slide the plastic clamping sleeve towards the lever arm mounting.

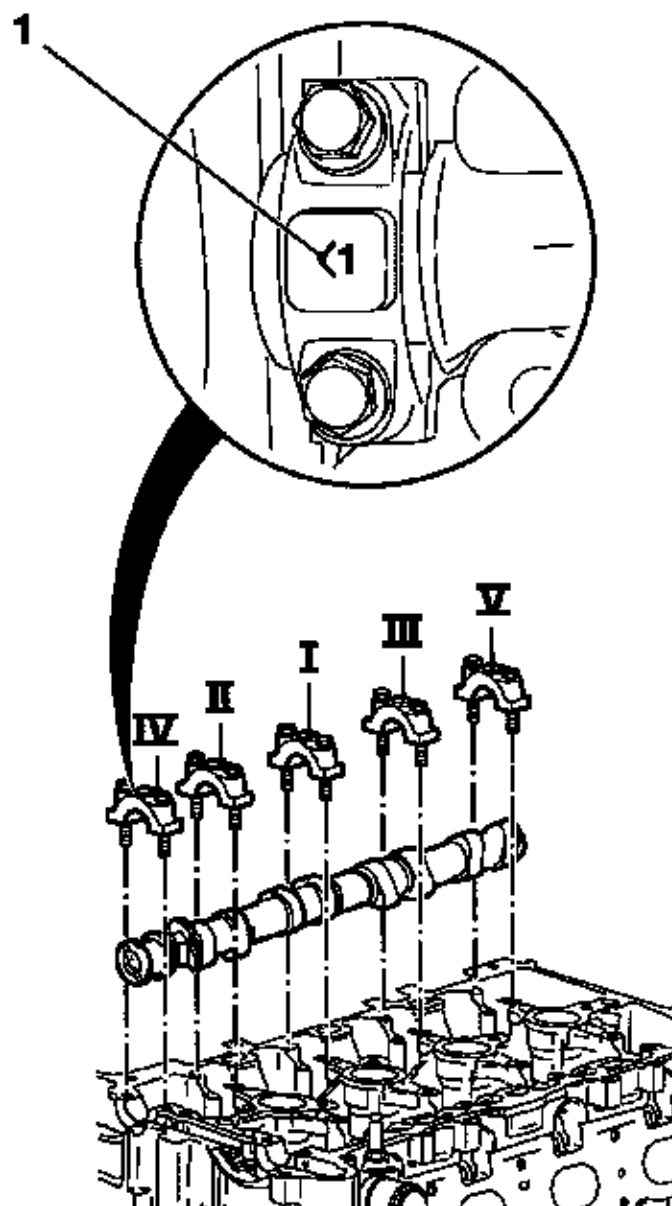
**Important:** Insert the valve collets with the narrower part facing the valve.

    - Slide the plastic clamping sleeve towards the valve.
  - Attach the installation head to the lever arm.
  - Carefully press down the valve spring.
 

**Important:** The installation head must be vertical over the valve stem. The valve collets must engage audibly.

    - Use the lever arm **MKM-889-12**
- 71.** Check the installation position.
- Important:** Do not carry out a second attempt without checking that both valve collets are seated in the installation head.
- Check the seat of the valve collets (visual inspection).
- 72.** Detach the compressed air adapter **MKM-889-17**.
- Interrupt the compressed air supply.
  - Unscrew it from the spark plug thread of cylinder no. 3.
- 73.** Detach the automatic valve spring/lever assembly **MKM-889**.
- Release the assembly shaft.
  - Detach both supports together with the assembly shaft.
  - Detach the installation head from the lever arm.
- 74.** Insert the roller cam followers.
- Important:** Note the correct allocation.
- Coat the sliding surfaces with engine oil.
- 75.** Install the exhaust camshaft.
- Coat the sliding surfaces with engine oil.
- Important:** Note the identification markings and the correct allocation, arrow (1) points towards the timing chain end.
- Insert the camshaft and the camshaft bearings.
  - Install the camshaft bearing caps.
    - Working in a spiral pattern from the middle towards the outside, tighten the bolts on the camshaft bearing caps (I to V) in stages.
    - Tightening torque **9 Nm**
- 76.** Important:  
Note the correct allocation.
- 77.** Insert the roller cam followers.
- Coat the sliding surfaces with engine oil.





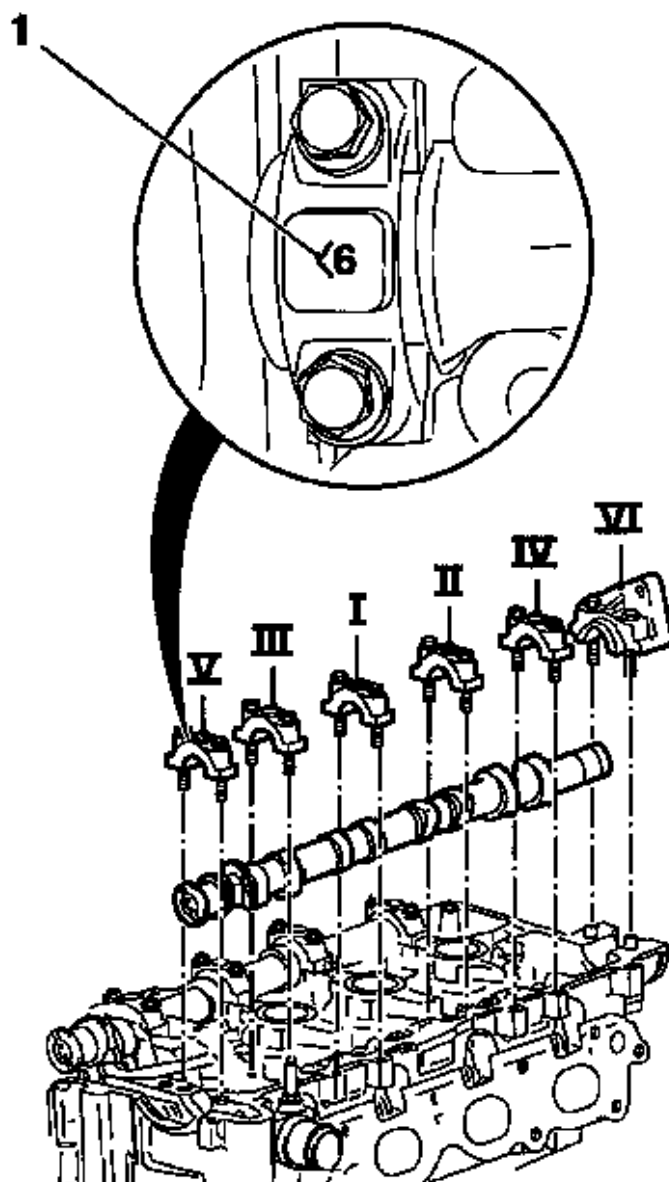
L 5752

**78.** Install the intake camshaft.

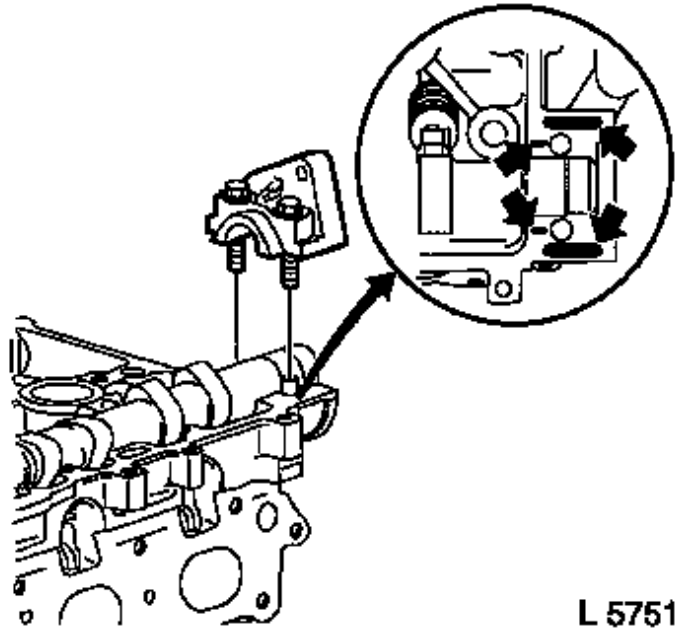
- Clean the sealing surfaces of camshaft bearing cap no. 11
- Coat the sliding surfaces with engine oil.

**Important:** Note the identification markings and the correct allocation, arrow (1) points towards the timing chain end.

- Insert the camshaft and the camshaft bearings.

**L 5753**

79. Install the camshaft bearing caps.
- Coat the sealing surfaces of camshaft bearing cap no. 11 with silicone sealant (grey) (arrows).



L 5751

80. Working in a spiral pattern from the middle towards the outside, tighten the bolts on the camshaft bearing caps (I to VI) in stages.

- Tightening torque (M6) **9 Nm**, (M8) **22 Nm**

81. Attach the camshaft connecting flange cover.

- Use a new gasket.
- Tightening torque **23 Nm**

82. Attach the intake camshaft sprocket.

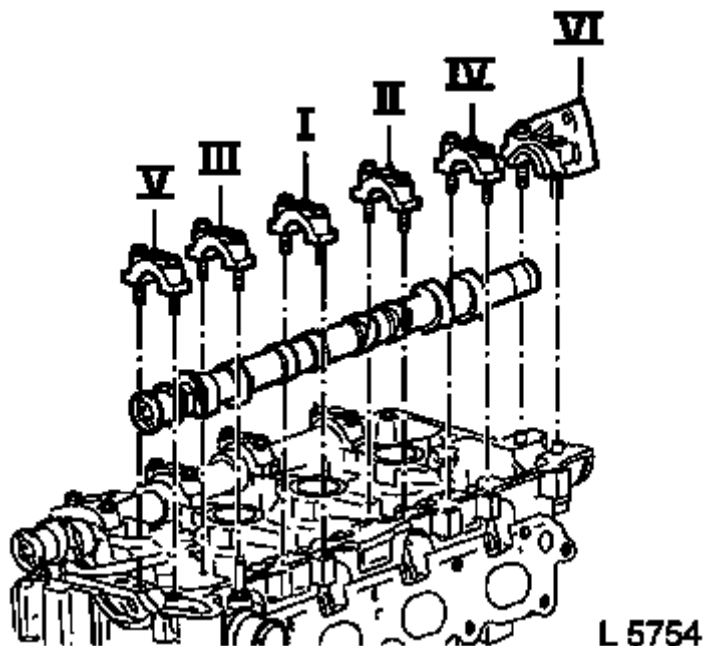
- Use a new bolt.
- Hold the intake camshaft by the hexagon.
  - Tightening torque **85 Nm + 30° + 15°**

83. Attach 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°**

84. Install the camshaft timing chain tensioner.

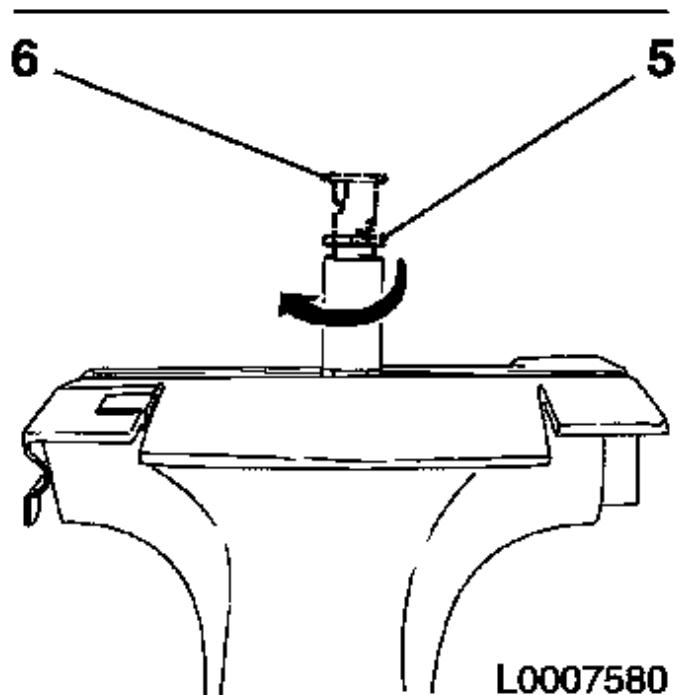
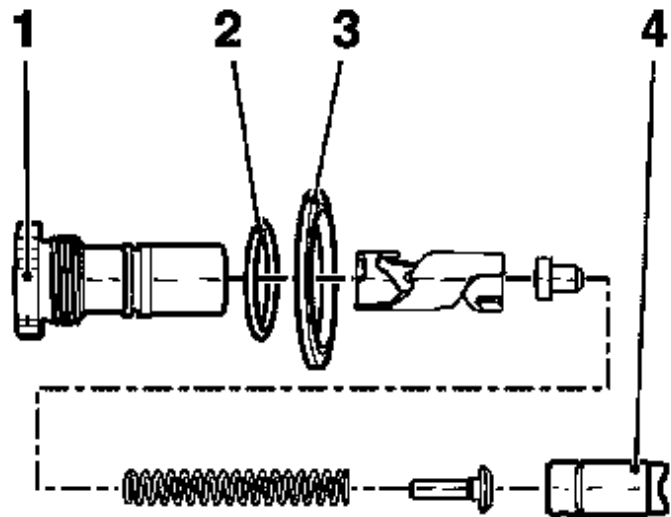
- Pull out the piston (4) from the housing (1).
  - Clamp the piston at the square into a vice.
  - Turn clockwise to lock the



L 5754

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**

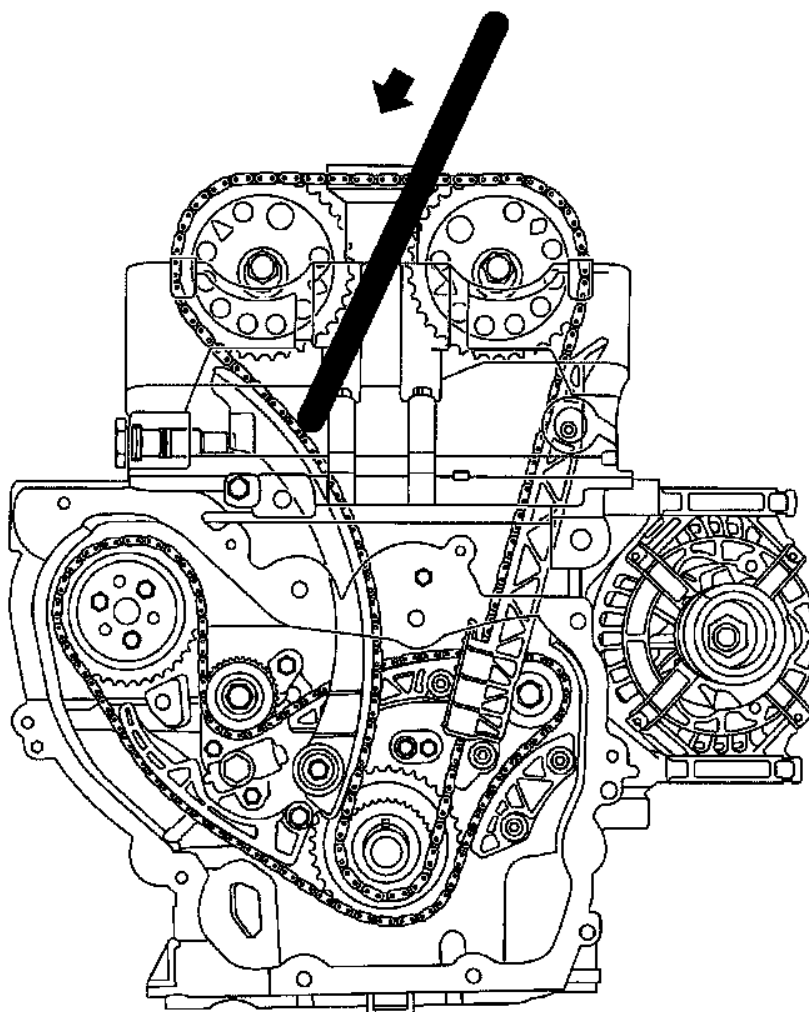


**Important:** Failure to follow this instruction could cause the camshaft timing chain to jump.

85. 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).
86. Recut the thread.
  - 2 off

**87. Install the guide rail.**

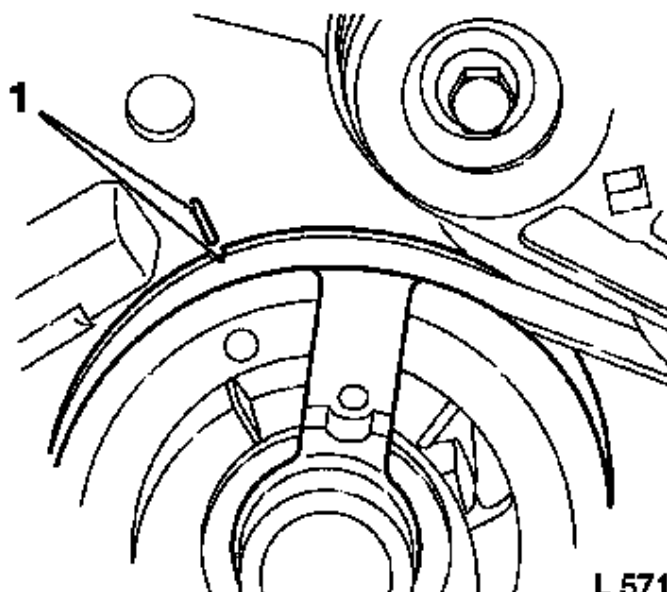
- Coat the bolts with thread locking compound (red) and insert them.
  - Tightening torque **8 Nm**



J 0935

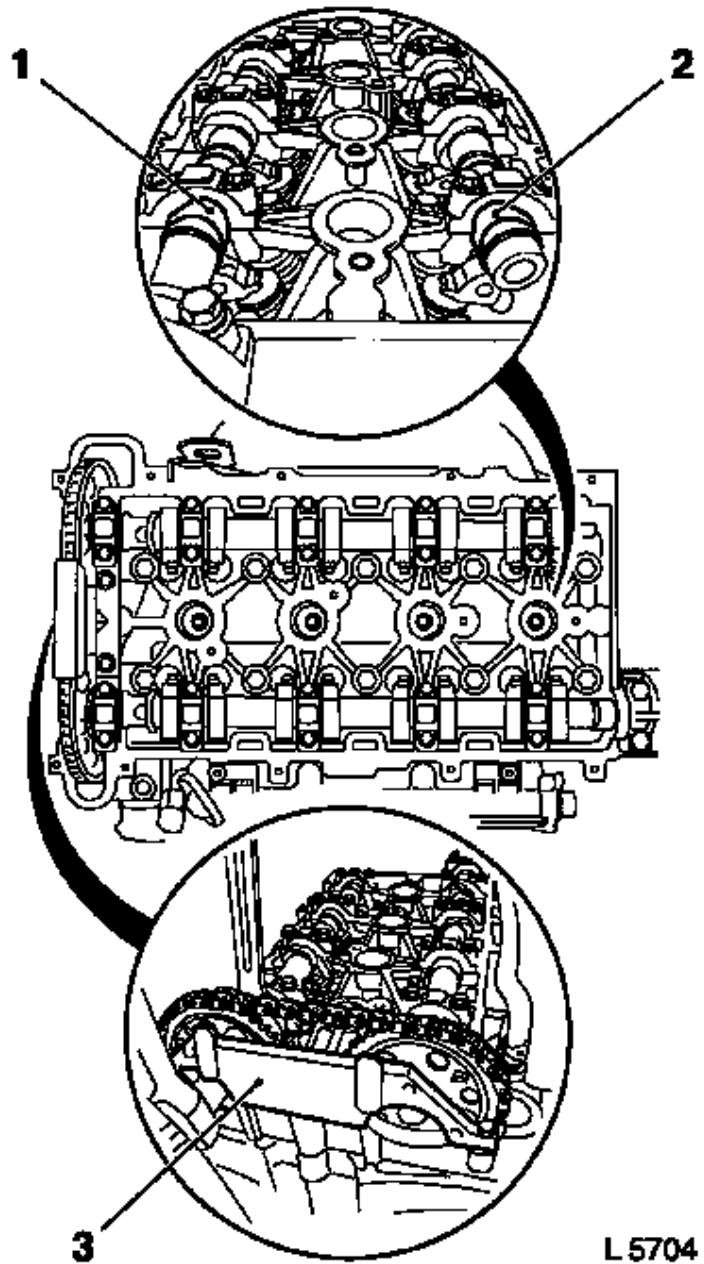
**88. Raise the lifting ramp.****89. Rotate the crankshaft 720°.**

- Rotate the crankshaft in the normal direction of rotation to TDC on cylinder no. 4 (marking 1).



L 5716

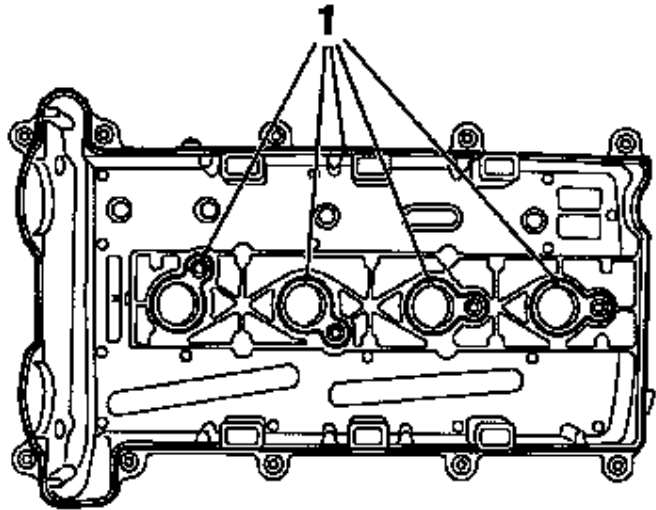
90. Note:  
In this position the cams (1) and (2) of cylinder no. 4 point upwards, and it must be possible to insert blocking tool **KM-6148** (3).
91. Install the lower engine splash shield
92. Lower the lifting ramp.
93. Detach **KM-6148**.



94. 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**

- 95.** Attach the ignition module.
- Tightening torque **9 Nm**
  - Attach and secure the wiring harness connector.



**L 5706**

- 96.** Connect the fuel lines.
- 2 union nuts
    - Tightening torque **10 Nm**
  - 2 bolts
    - Tightening torque **9 Nm**
- 97.** Install the rear engine cover.
- Check the alignment.
  - 6 bolts, tightening torque **14 Nm**
- 98.** Close the rear engine cover.
- 99.** Connect the battery.
- 100.** Close the bonnet.
- 101.** Reprogram the volatile memories.