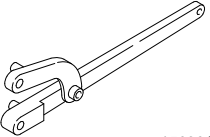
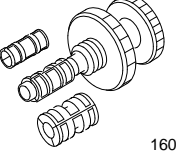
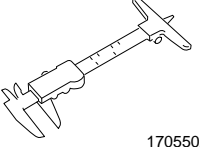
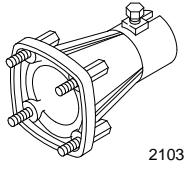
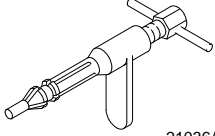
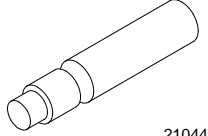
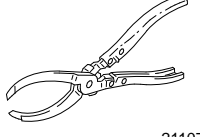
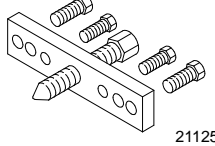
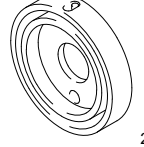
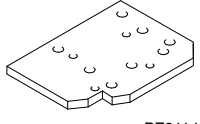
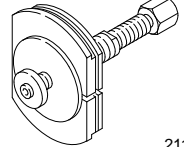
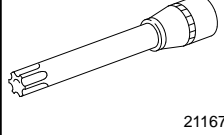
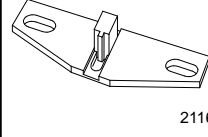
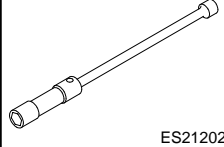
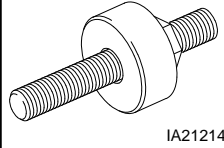
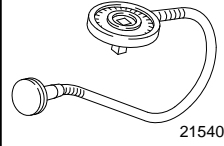


Engine – Dismantle and Assemble (21 134 8)

Special Tools

 15030A	15-030A Universal flange-holding wrench
 16067	16-067 Locator for clutch disc
 1705502	17-055-02 Depth gauge, adjusting shim
 21031B	21-031 B Engine mounting bracket
 21036A	21-036A Remover for pilot bearing
 21044A	21-044A Installer/centring pin, pilot bearing
 21107	21-107 Pliers, hydraulic tappets
 21125	21-125 Extractor, balancer shaft end float measurement
 21141	21-141 Installer, crankshaft rear oil seal
 PZ21146C	21-146C Engine mounting plate

 21147	21-147 Vibration damper remover
 21167	21-167 Wrench for cylinder head bolts
 21168	21-168 Crankshaft locking tool
 ES21202	21-202 Socket, spark plugs
 IA21214	21-214 Installer, vibration damper
 21540	21-540 Bolt tightening angle gauge

Proprietary Tools

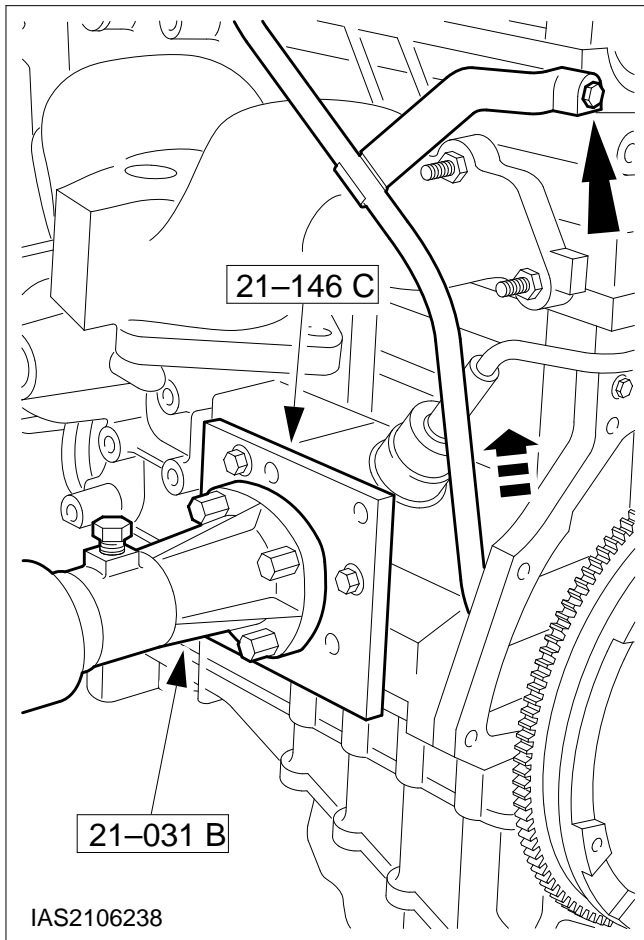
Piston ring compressor
Piston ring pliers
Dial indicator
Measuring fixture
External micrometer gauge
Internal gauge
E8 Torx wrench
E10 Torx wrench
T20 Torx wrench
T25 Torx wrench
T30 Torx wrench
T55 Torx wrench
Twist drill, 2,5 mm diameter
Steel straight edge
Oil filter strap wrench

Workshop Equipment

Assembly stand with geared drive	21-187
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Materials

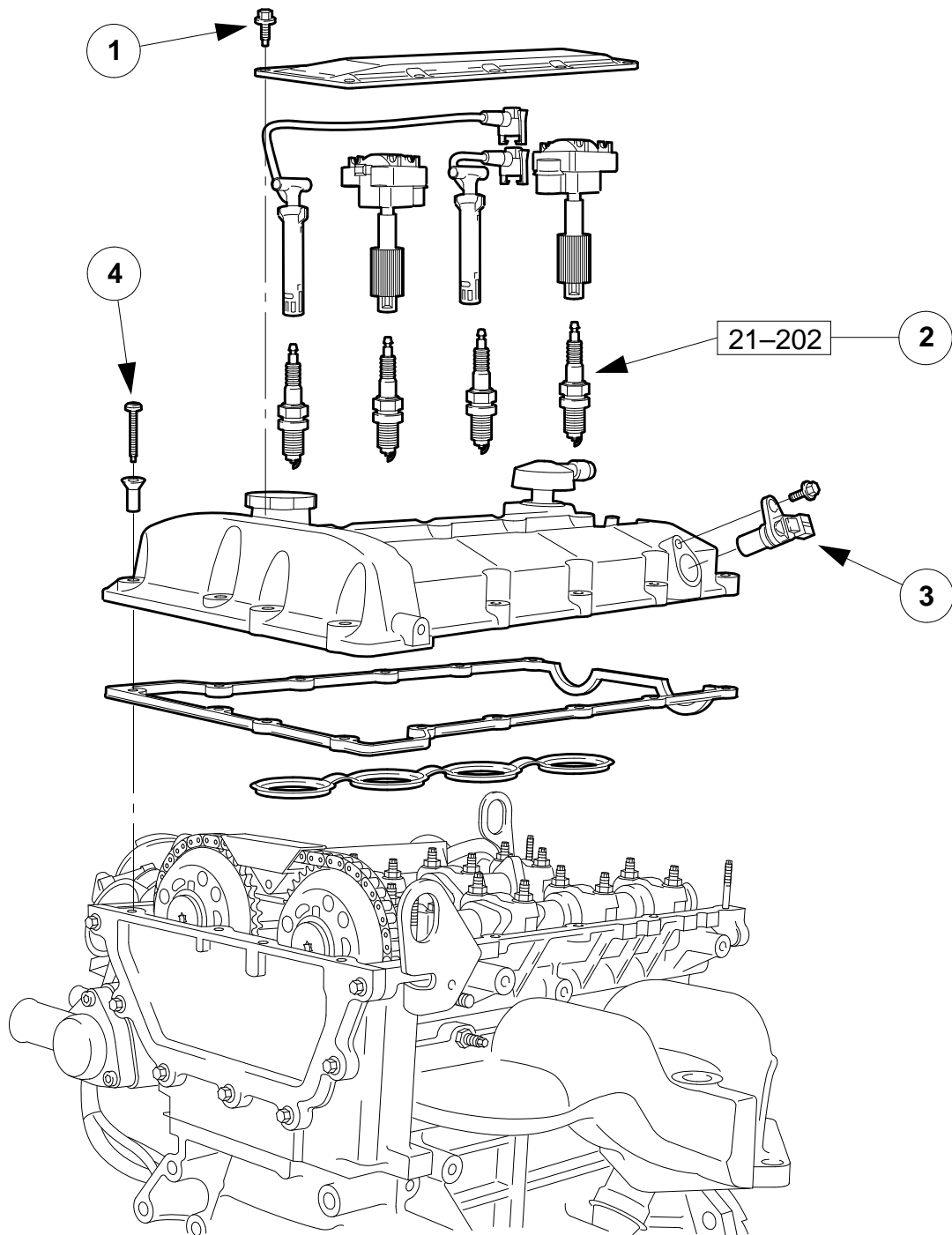
Engine oil	
Spark plug thread lubricant ('Never Seez')	ESE-M1244-A
Lubricant, crankshaft position sensor (CKP sensor)	WSD-M1C226-A
Sealer, coolant temperature sensor, coolant pump angle connector, oil pressure switch (Loctite 243)	WSK-M2G349-A7
Plastigage	Obtainable from: Replacement Services Limited, 30, Euston Street, Freemans Industrial Estate, Leicester, LE2 7ST
Sealer for crankshaft rear oil seal carrier	WSE-M4G323-A6
Bolt M6 X 60	



Dismantle

1. Attach the engine to the assembly stand.

- Drain off the engine oil.
- Detach the oil filter.
- Undo the oil dipstick tube and pull it out.

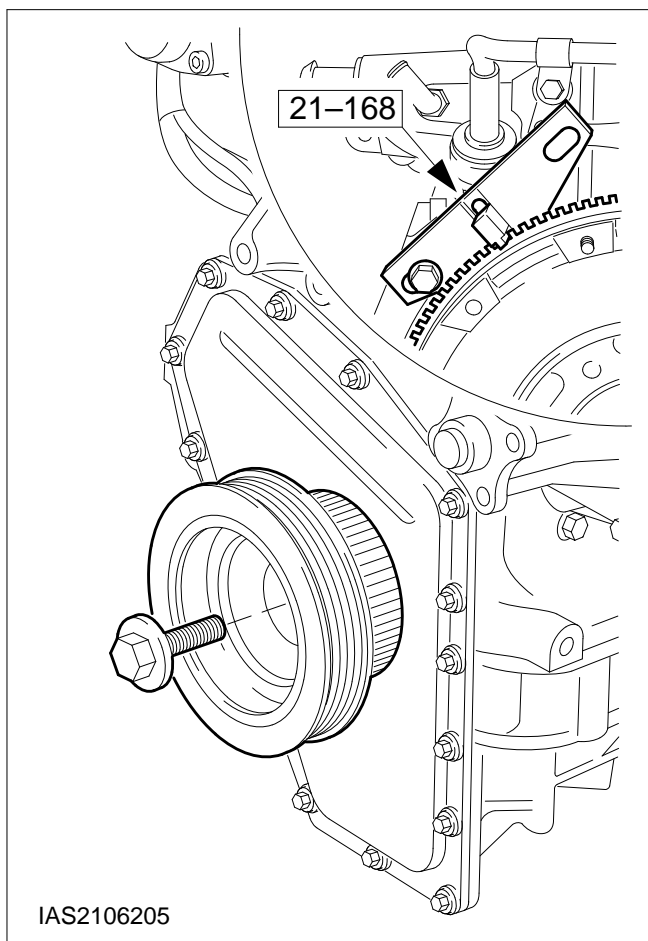


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2. Remove the cylinder head cover.

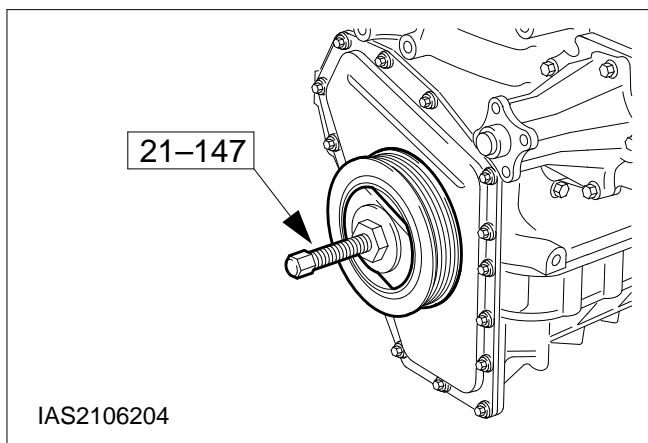
- 1 Remove the ignition coil cover (10 bolts).
- 2 Pull off the spark plug caps, remove the coils and spark plugs.
- 3 Remove the camshaft position sensor (CMP sensor).
- 4 Remove the cylinder head cover (four nuts, 11 bolts).

Remove the gaskets.

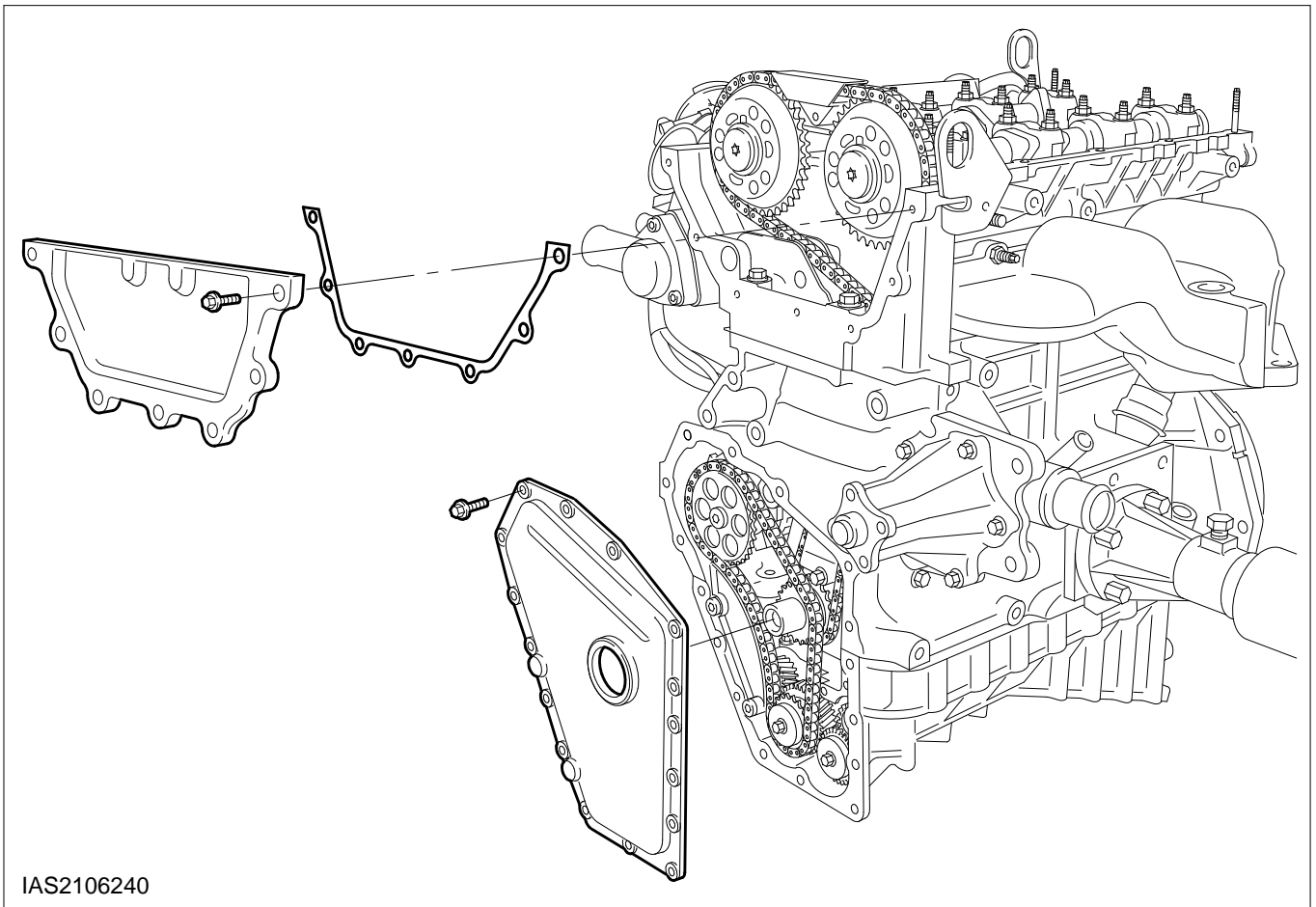


NOTE: Lock the flywheel.

3. Remove the vibration damper bolt.

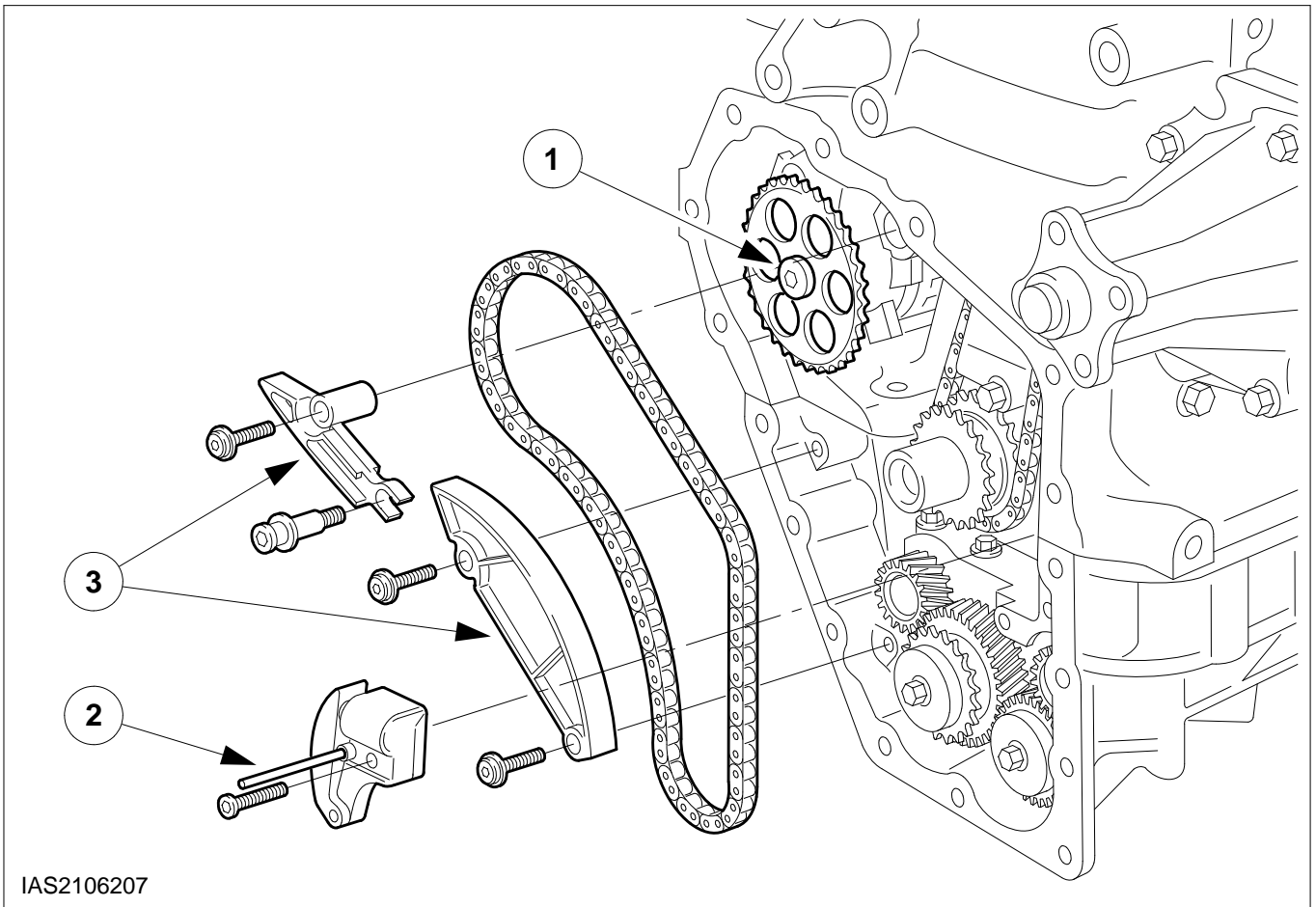


4. Pull off the vibration damper.



- 5. Remove the timing chain covers (seven bolts for the top, 16 bolts for the bottom).**

Remove the gasket.



6. Dismantle the oil pump chain drive.

NOTE: Do not remove the bolt.

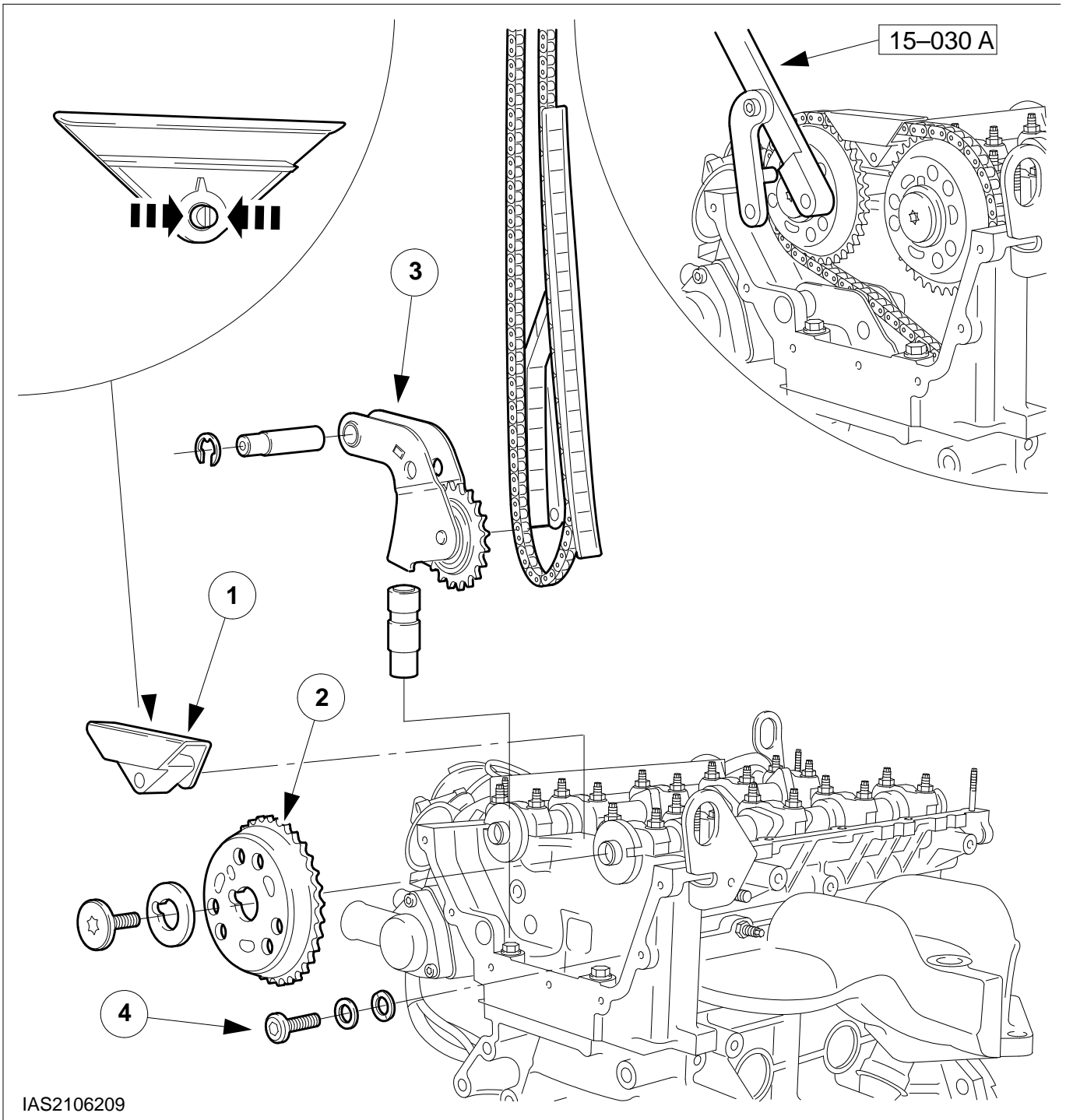
1 Loosen the oil pump sprocket bolt.

NOTE: Wrap adhesive tape around the twist drill flutes.

2 Press the chain tensioner together, lock it with a twist drill (2,5 mm diameter) and remove it.

3 Remove the chain guide.

Take off the chain.



IAS2106209

7. Remove the timing chain.

1 Remove the chain guide.

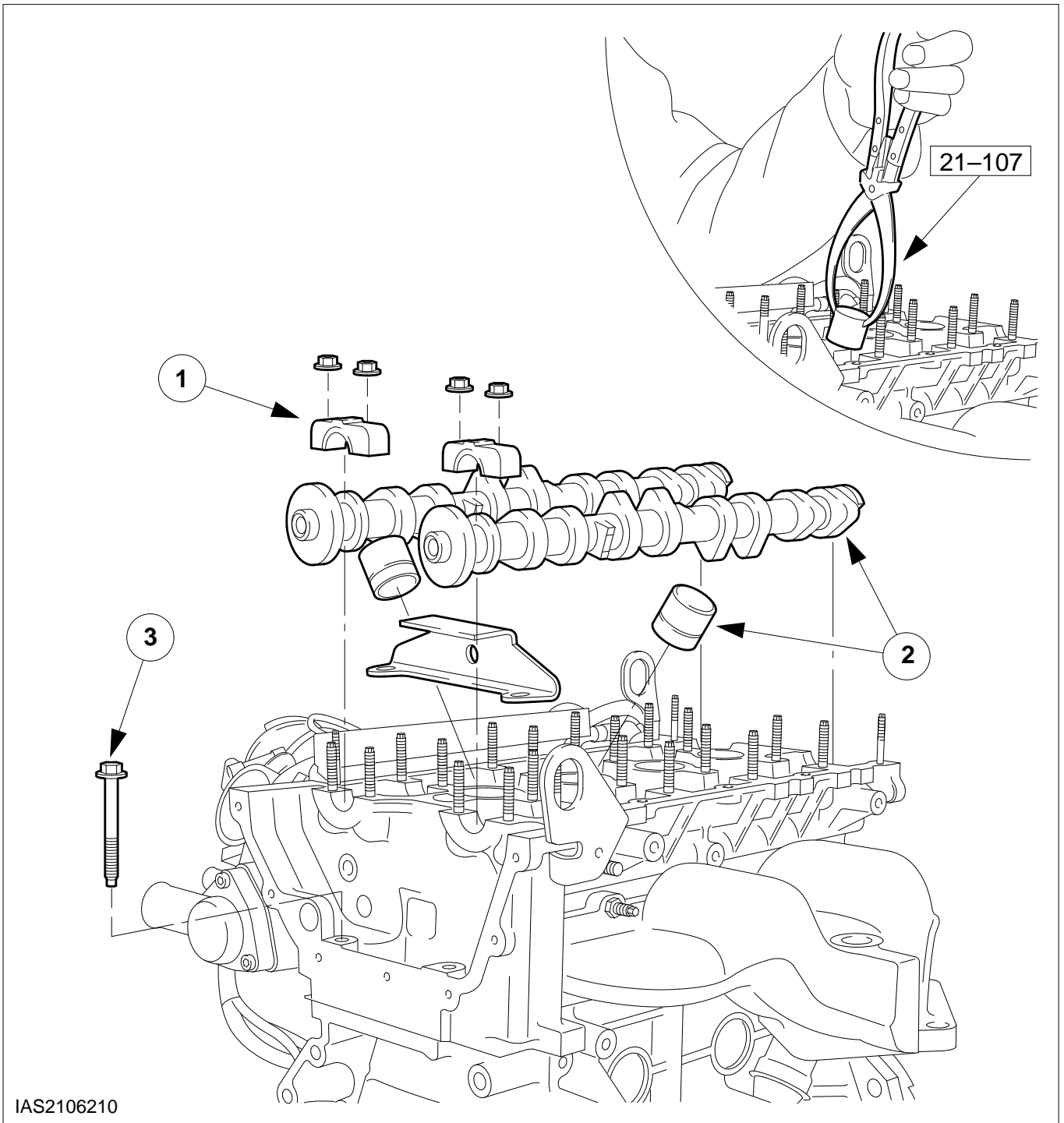
NOTE: Hold the flange with the special tool. Tie the chain up with wire to stop it from falling into the timing chain housing.

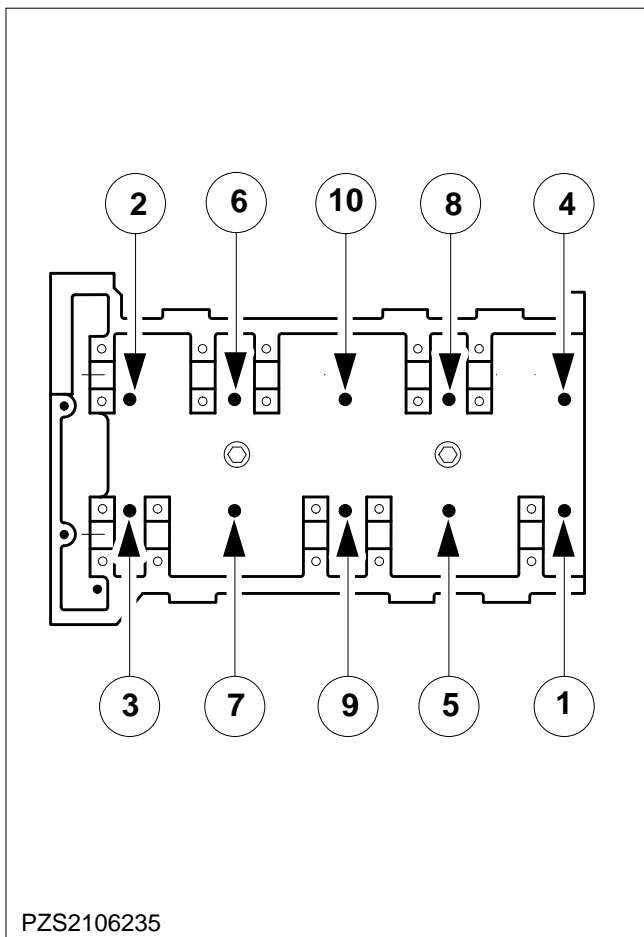
2 Undo the camshaft sprockets and remove them.

3 Remove the chain tensioner.

- Remove the lock washer.
- Extract the pivot bolt using an M6 bolt.
- Take out the chain tensioner and hydraulic plunger.

4 Remove the chain guide bolt and pull the chain guide up and out together with the chain.





8. Remove the camshafts.

NOTE: Store the bearing caps, camshafts and hydraulic tappets in sequence.

NOTE: The intake camshaft has two identification rings between the fourth and fifth cam

NOTE: Front bearing cap with chain guide bracket.

- 1 Remove the bearing caps.
- 2 Take out the camshafts and hydraulic tappets.
- 3 Remove the three bolts from the cylinder head.

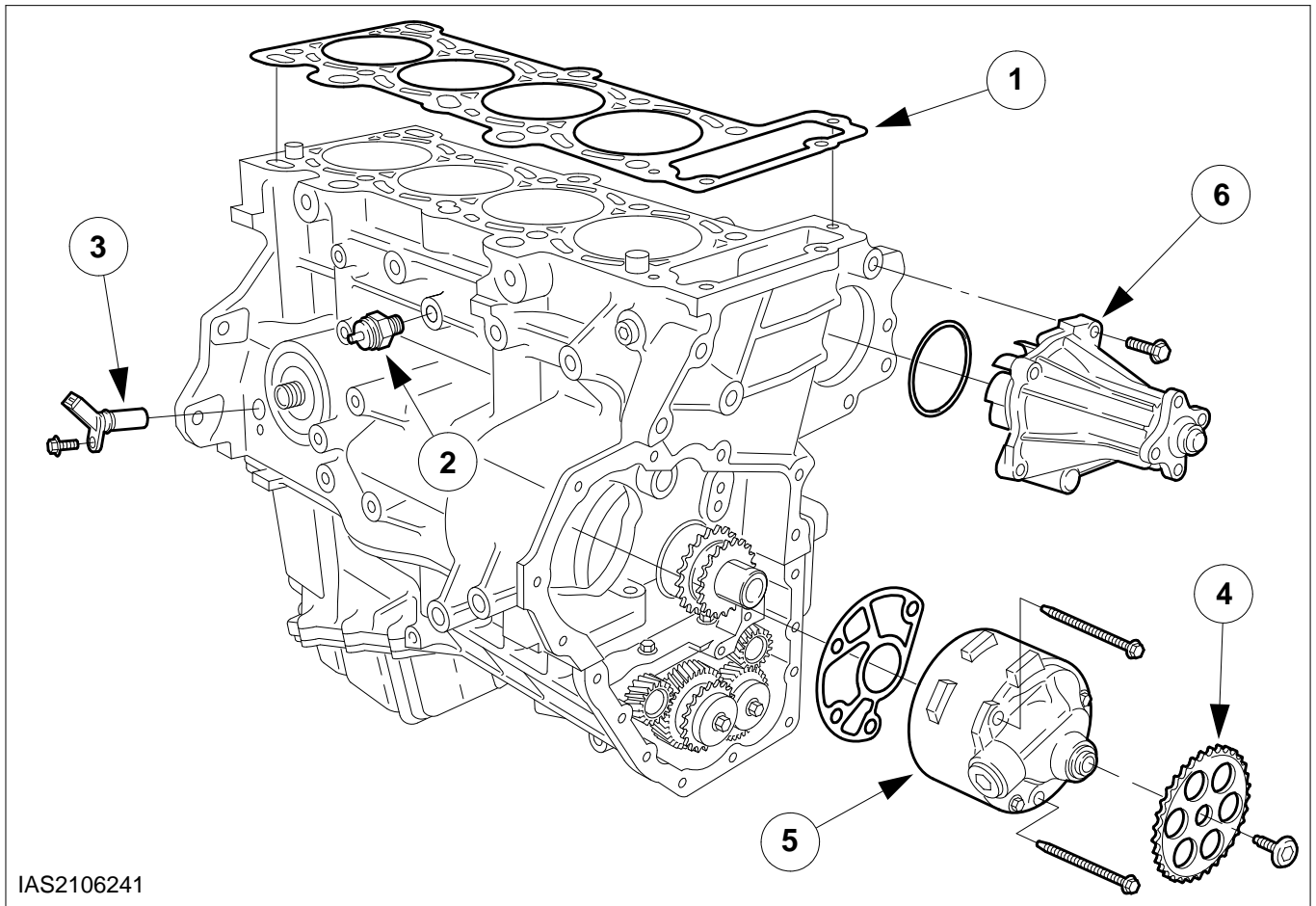
NOTE: Lay the cylinder head down only on a soft surface.

NOTE: Do not re-use the bolts.

NOTE: Bolt-slackening sequence.

9. Detach the cylinder head.

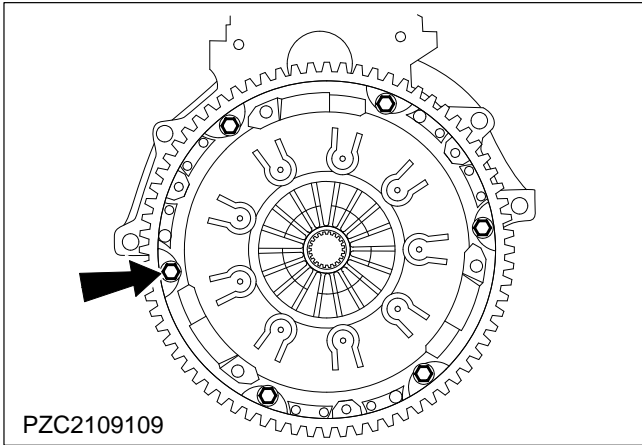
- Pull off the connectors from the oil pressure switch and the crankshaft position sensor (CKP sensor).
- Lift the cylinder head and lay it down on a soft surface.



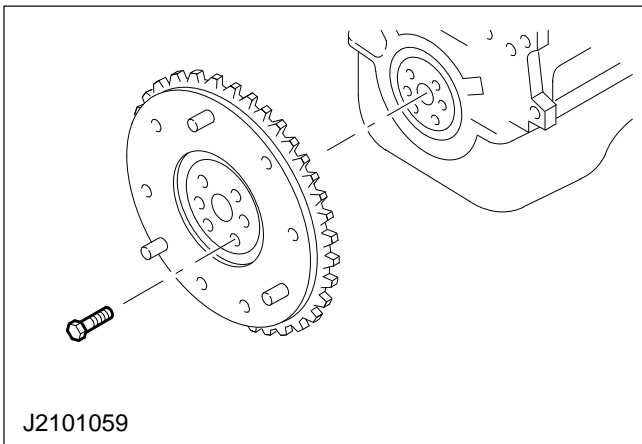
IAS2106241

10. Remove the components of the oil and coolant circulation systems.

- 1 Take off the cylinder head gasket.
- 2 Oil pressure switch
- 3 Crankshaft position (CKP) sensor.
- 4 Oil pump sprocket.
- 5 Remove the oil pump.
Remove the gasket.
- 6 Detach the coolant pump.
Take out the seal.



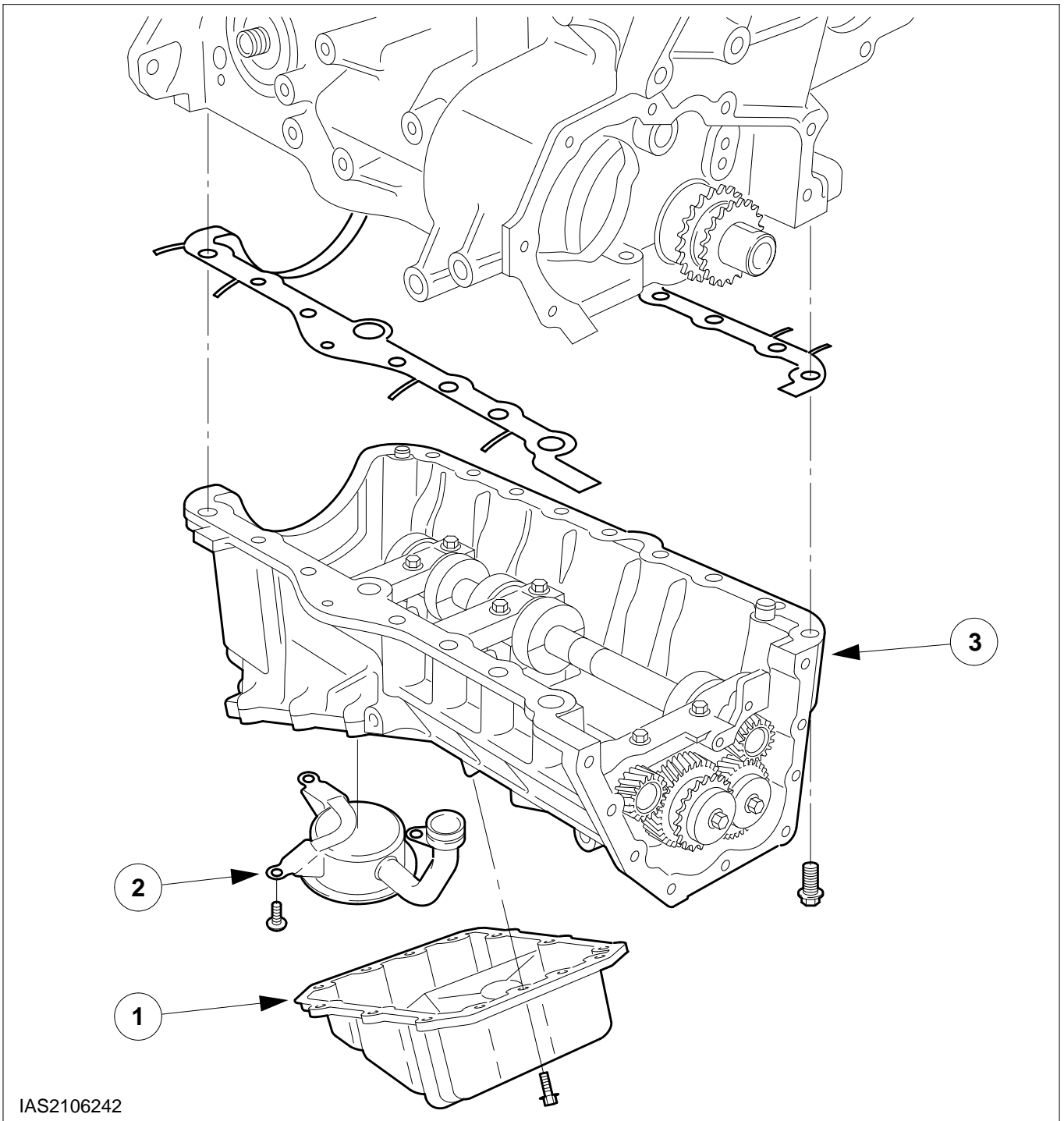
11. Detach the clutch assembly.



NOTE: Do not re-use the bolts.

12. Detach the flywheel.

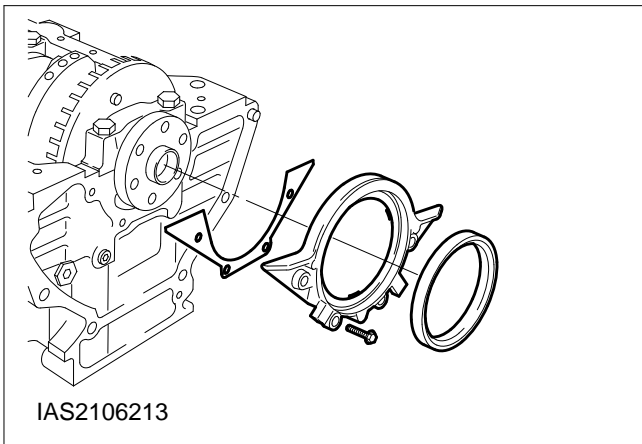
Remove the special tool 21-168.



13. Remove the sump and balancer shaft housing.

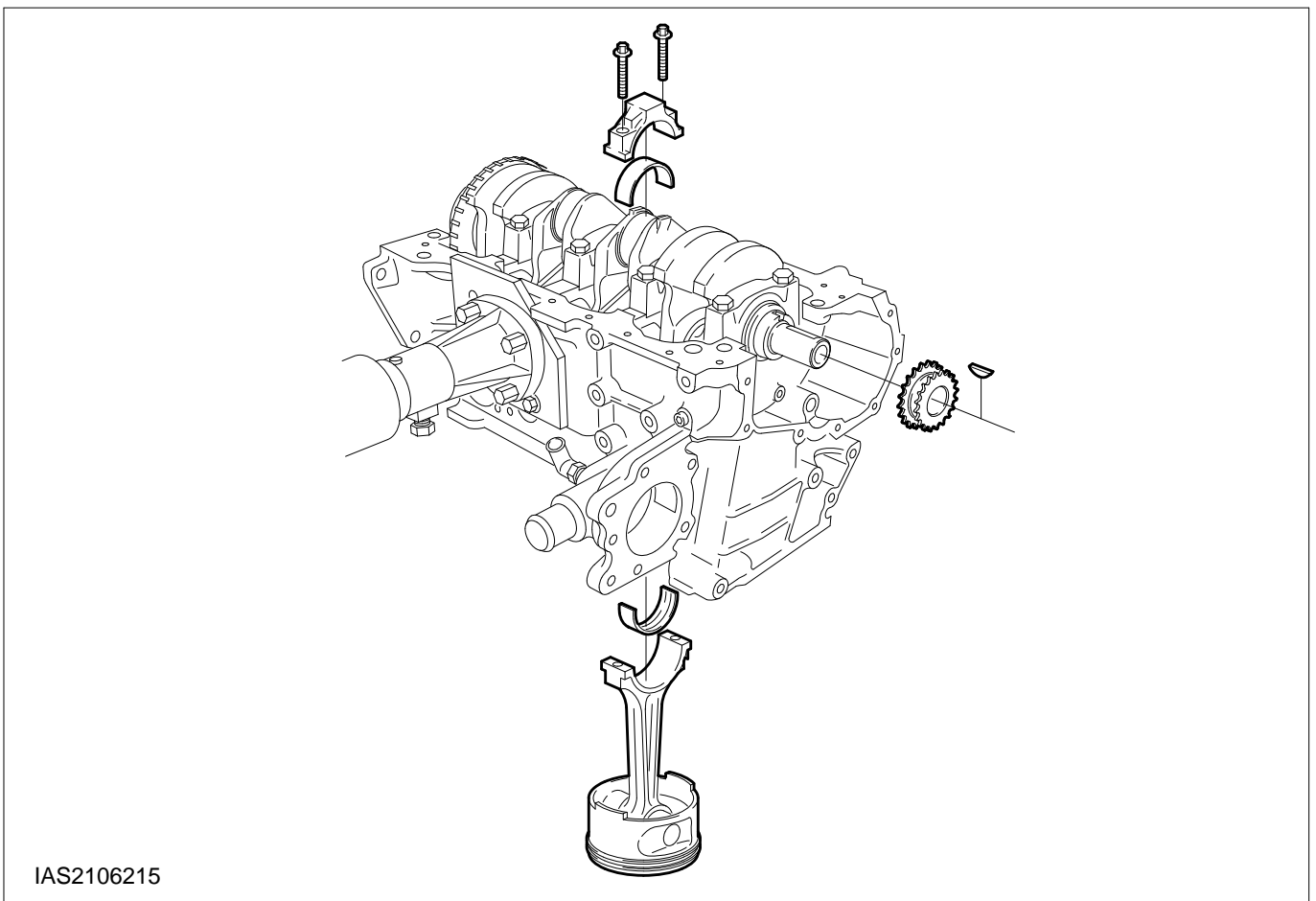
NOTE: Only remove the sump and balancer shaft housing from below, so that no oil sludge or abraded particles can enter the engine.

- 1 Remove the sump.
- 2 Remove the oil intake tube.
- 3 Remove the balancer shaft housing and gasket.



14. Remove the crankshaft rear oil seal carrier.

- Remove the gasket.
- Drive out the oil seal on a flat surface.

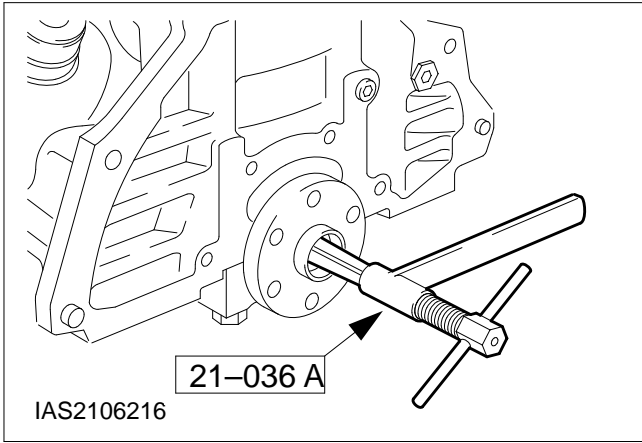


NOTE: Store the bearing caps and shells in sequence.

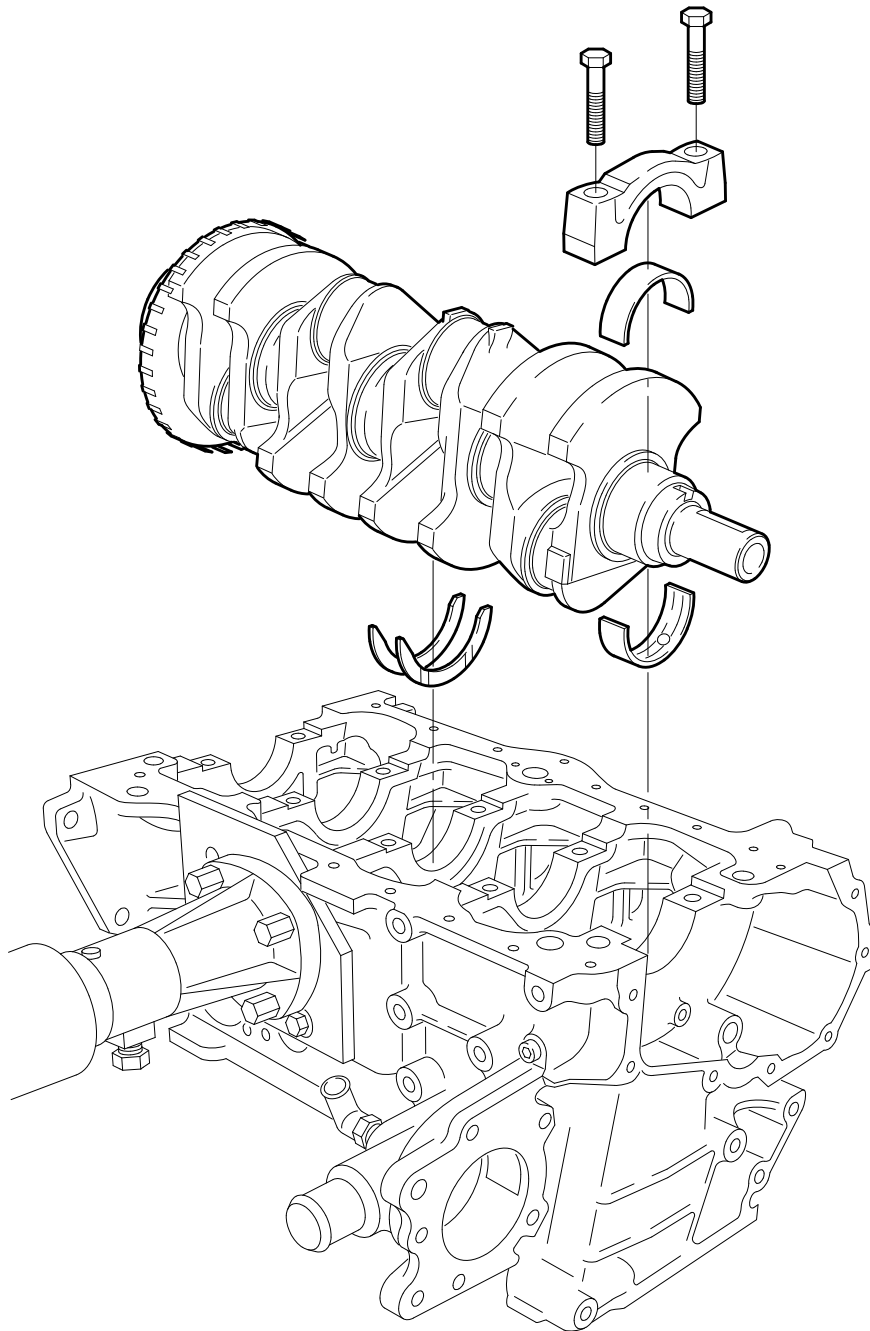
NOTE: Do not damage the cylinder bores.

15. Remove the pistons and connecting rods.

- Remove the Woodruff key and take off the crankshaft sprocket.
- Remove the carbon from the upper edge of the cylinder bore.



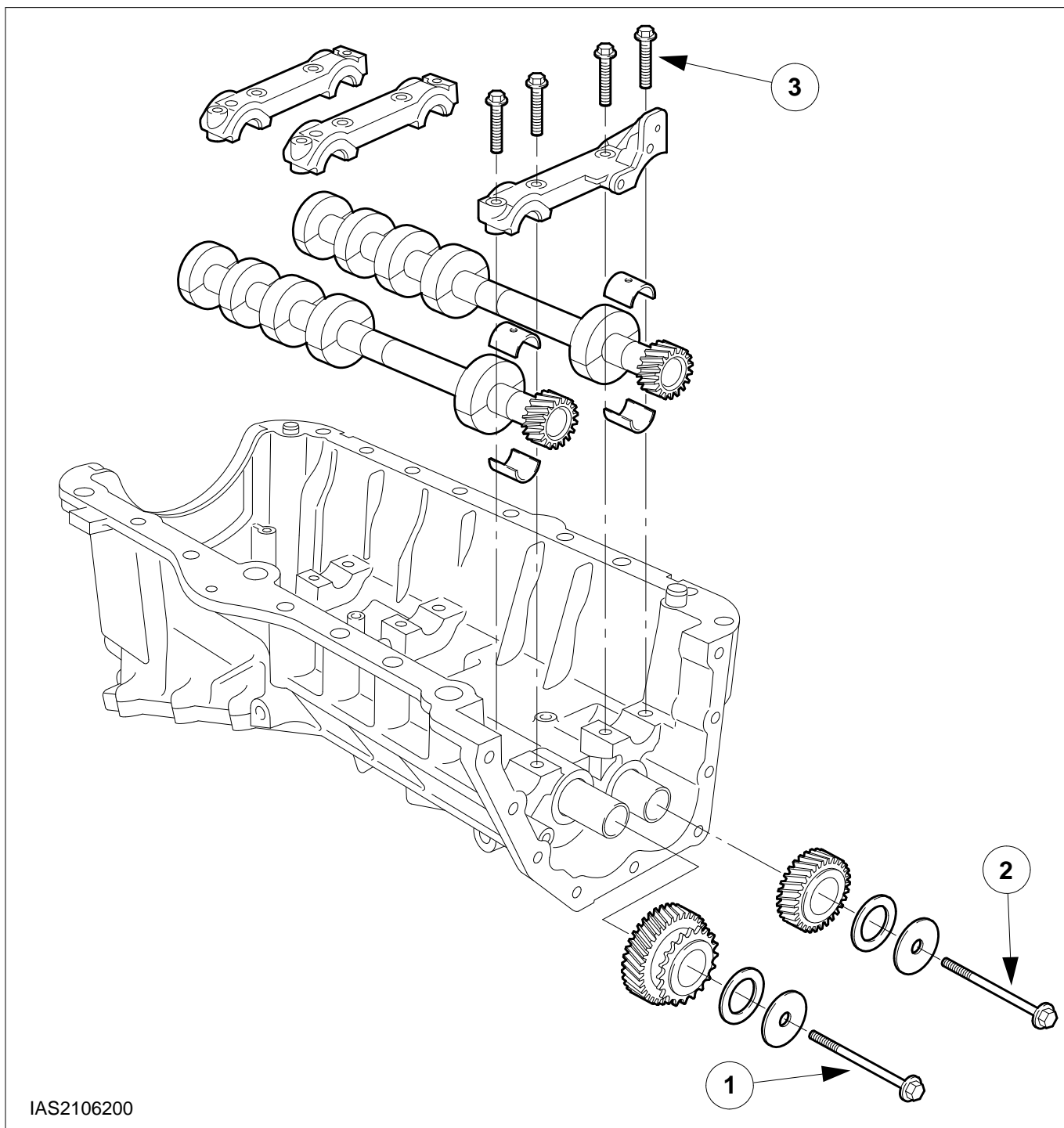
16. Remove the crankshaft pilot bearing.



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NOTE: Store the bearing caps, shells and thrust half washers in sequence.

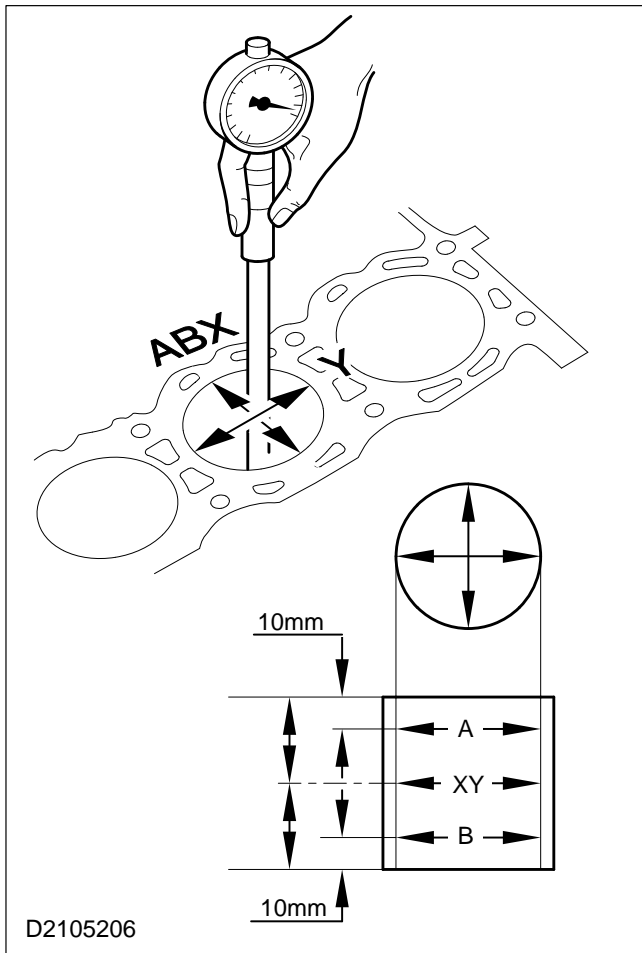
17. Remove the crankshaft.



NOTE: Store the balancer shafts and bearing shells in sequence.

18. Dismantle the balancer shaft housing.

- 1 Remove the gear wheels.
- 2 Remove the balancer shafts.

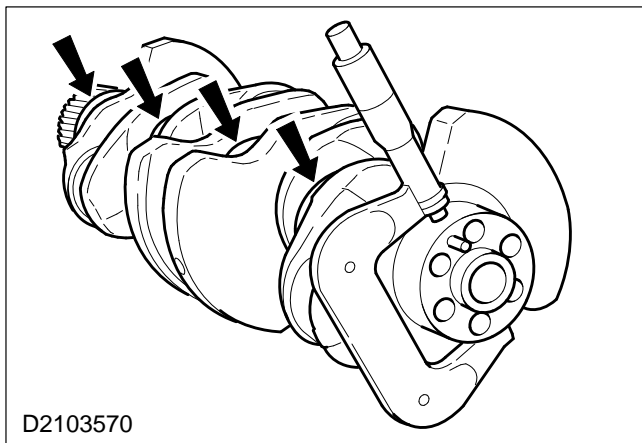


Assemble

19. Thoroughly clean all sealing surfaces and re-useable parts, check them for damage and renew as necessary.

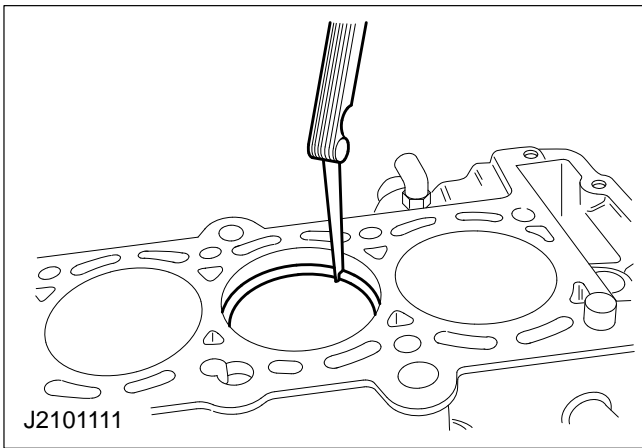
20. Measure the cylinder bores.

NOTE: Measurements which fall both in the top part of one bore range and in the lower part of the next range above should be taken to be in the smaller range.



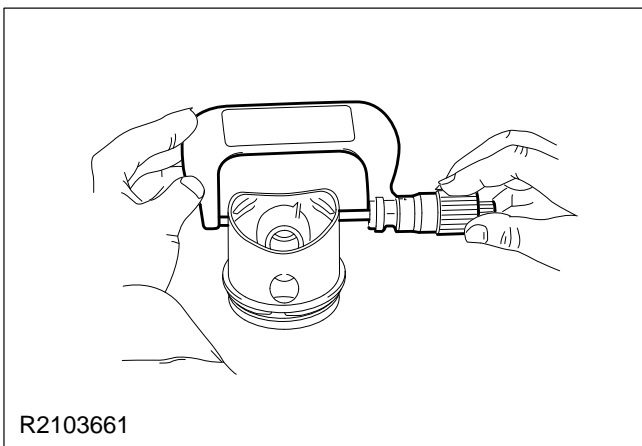
21. Measure the diameter of the main and big-end journals.

Repeat the measurement at 90° intervals.



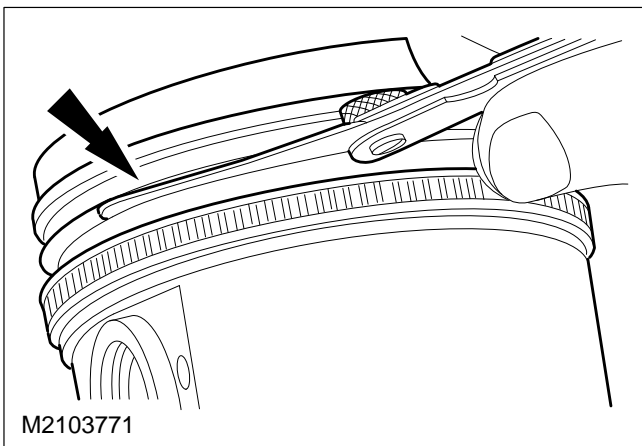
22. Check the piston ring gaps.

The values given in the General Specifications apply to a gauge ring which is used in production. The figures measured in the cylinder can exceed these by 0,15 mm.



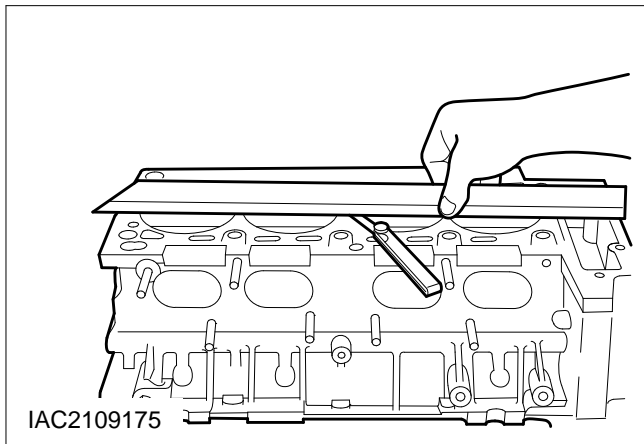
23. Measure the piston diameter.

Measure the piston diameter at piston pin level.



NOTE: Piston ring clearance must be measured with the piston ring proud of the piston surface.

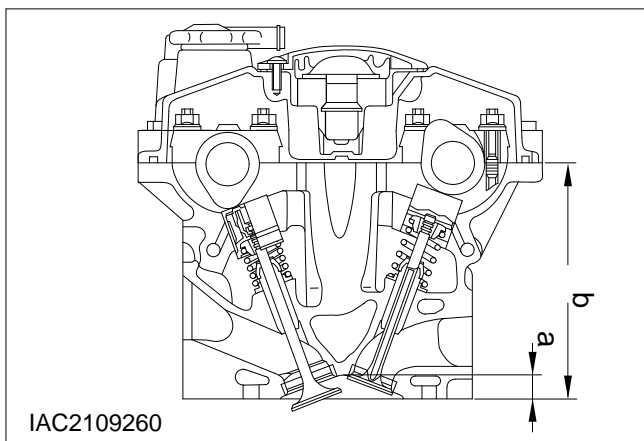
24. Measure the piston ring clearance.



NOTE: The straight edge must be at least 500 mm long and 5 mm wide.

25. Check the cylinder head for distortion.

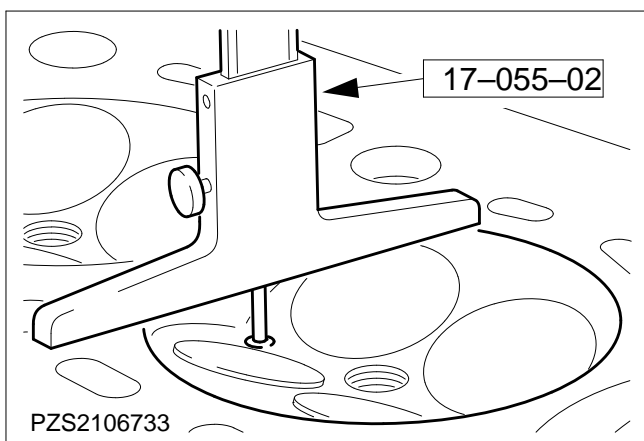
- Maximum allowable distortion over the combustion chamber steps: Across the cylinder head: 0,05 mm. Lengthways and diagonally along the cylinder head: 0,10 mm.
- Lay the straight edge across each combustion chamber and check each at three points.
- Lay the straight edge lengthways along the cylinder head and check at each combustion chamber step.
- Lay the straight edge diagonally along the cylinder head and check at each combustion chamber step.
- If necessary re-work the cylinder head.



26. Notes on re-working the cylinder head.

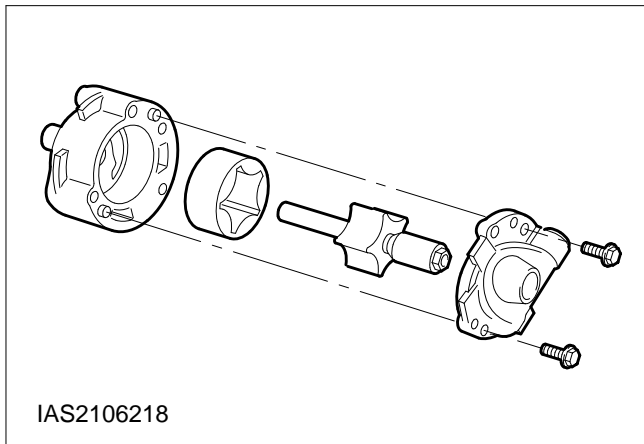
NOTE: Keep the average peak-to-valley height (Rz) at 0,0135 mm on re-working.

- The cylinder head may be re-worked to a maximum of 0,20 mm (by milling or surface grinding). Measurement "a" must not be less than 13,80 mm (see step 27.) and measurement "b" must not be less than 147,25 mm.



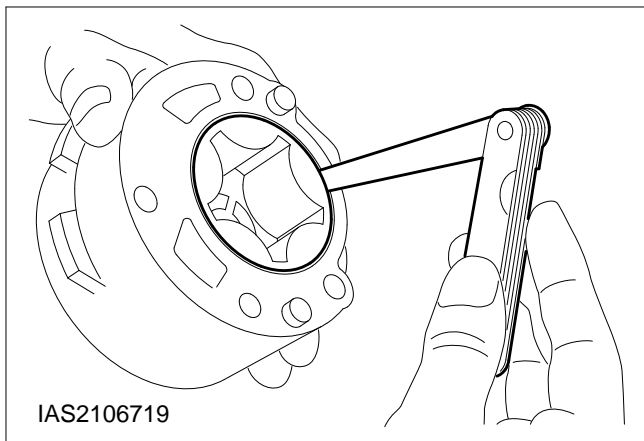
NOTE: Remove any carbon deposit where the measurement is to be made.

27. Measurement point in the combustion chamber for measurement "a".

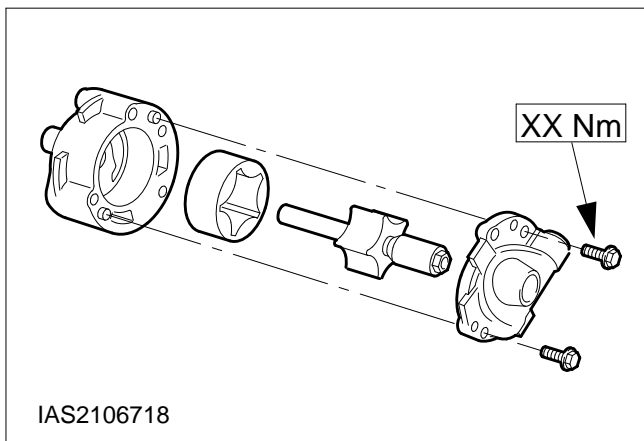


NOTE: The oil pump can only be renewed as a unit.

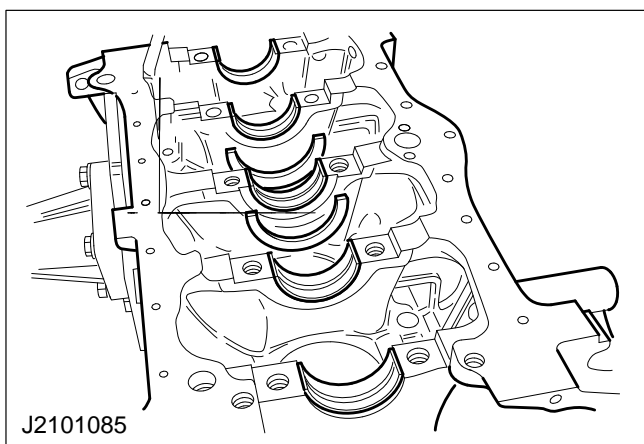
28. Dismantle the oil pump.



29. Check the radial clearance between the outer rotor and the oil pump housing.



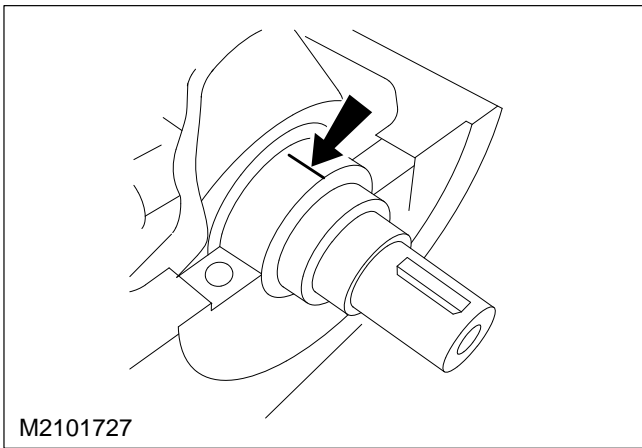
30. Reassemble the oil pump.



⚠ CAUTION: Do not damage the bearing running surfaces of the crankshaft during installation.

NOTE: Lay the bearing shells which have a groove and hole, free of oil, into the cylinder block.

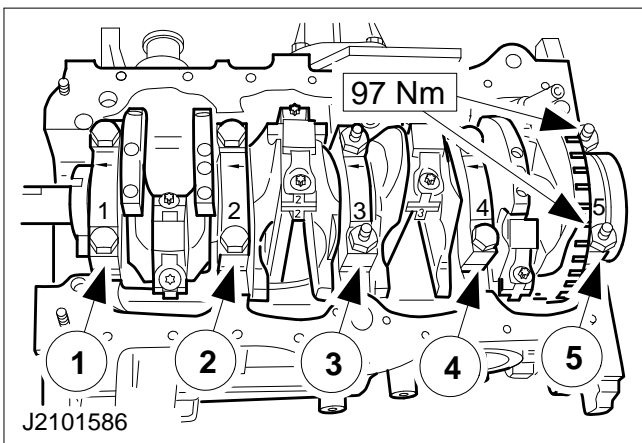
31. Fit the crankshaft without lubrication.



CAUTION: The crankshaft must not be turned during the measuring operation.

32. Measure the main bearing clearance.

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



NOTE: The bearing cap numbering starts at the timing chain end.

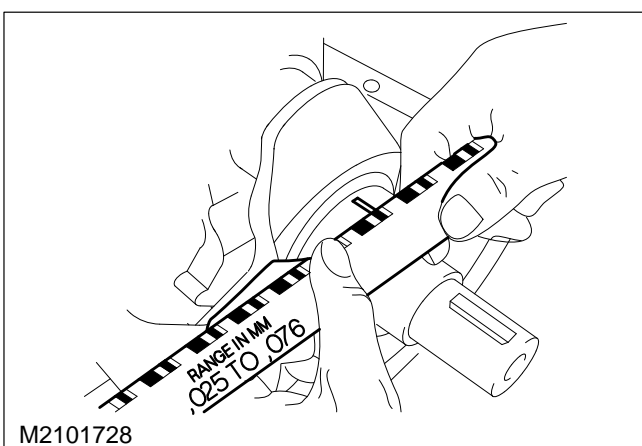
NOTE: Measure the bearing clearance in numerical sequence (one to five).

33. Measure the main bearing clearance (cont.).

Put the bearing cap with its corresponding bearing shell in place with the arrow pointing towards the timing chain end, and secure it.

NOTE: Do not strike the bearing caps.

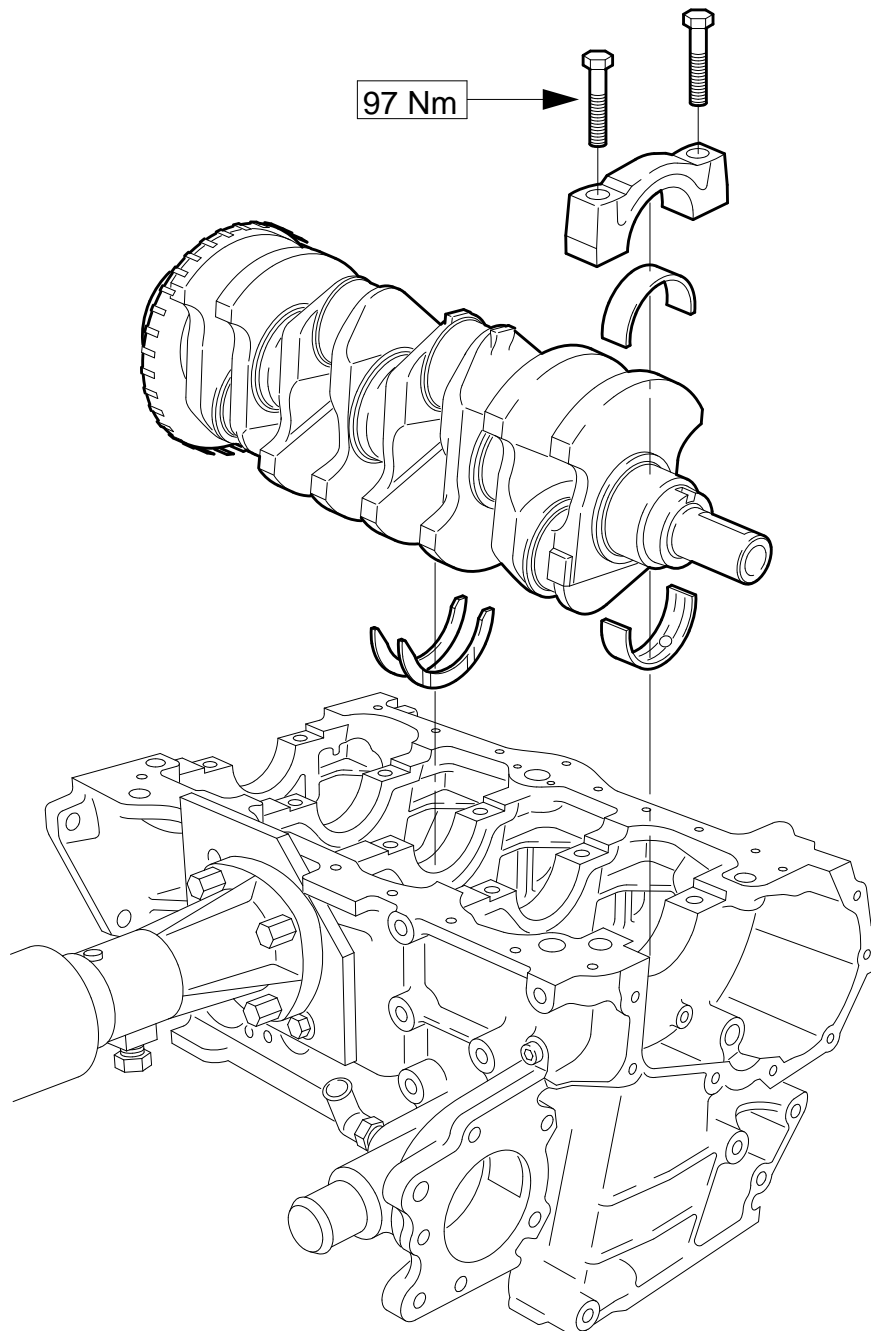
Remove the bearing cap.



34. Measure the main bearing clearance (cont.).

- Compare the Plastigage thread with the Plastigage scale.
- The reading corresponds to the bearing clearance.

NOTE: If the bearing clearance does not fall in range, then the bearing shells should be changed and the measurement procedure repeated from step 32.



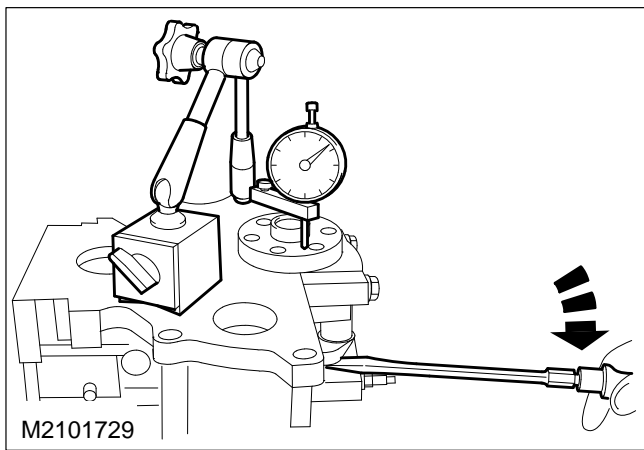
IAS2106717

NOTE: Put the thrust half washers in place with the grooves outwards.

NOTE: Lay the bearing shells which have the groove and hole in place in the cylinder block.

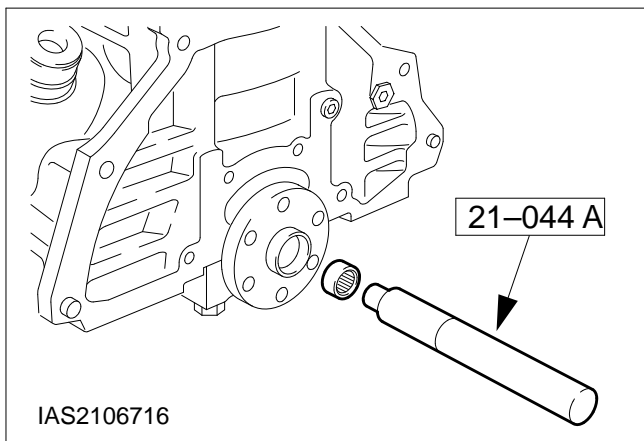
35. Install the crankshaft.

Oil the crankshaft bearing shells and thrust half washers.

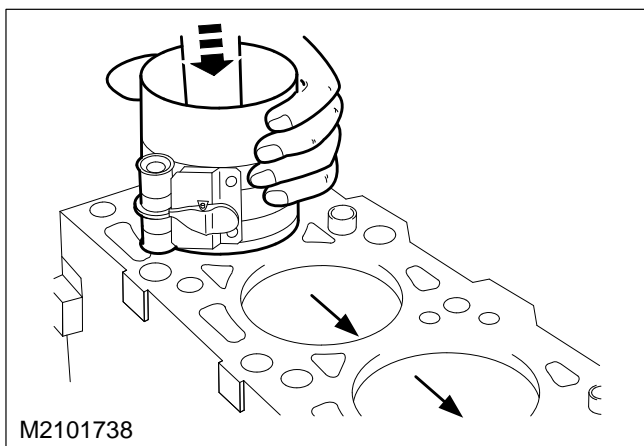


36. Measure the crankshaft end float.

- Measure the end float by lifting the crankshaft.
- Correct the end float if necessary using thrust half washers at the third main bearing.



37. Install the crankshaft pilot bearing.



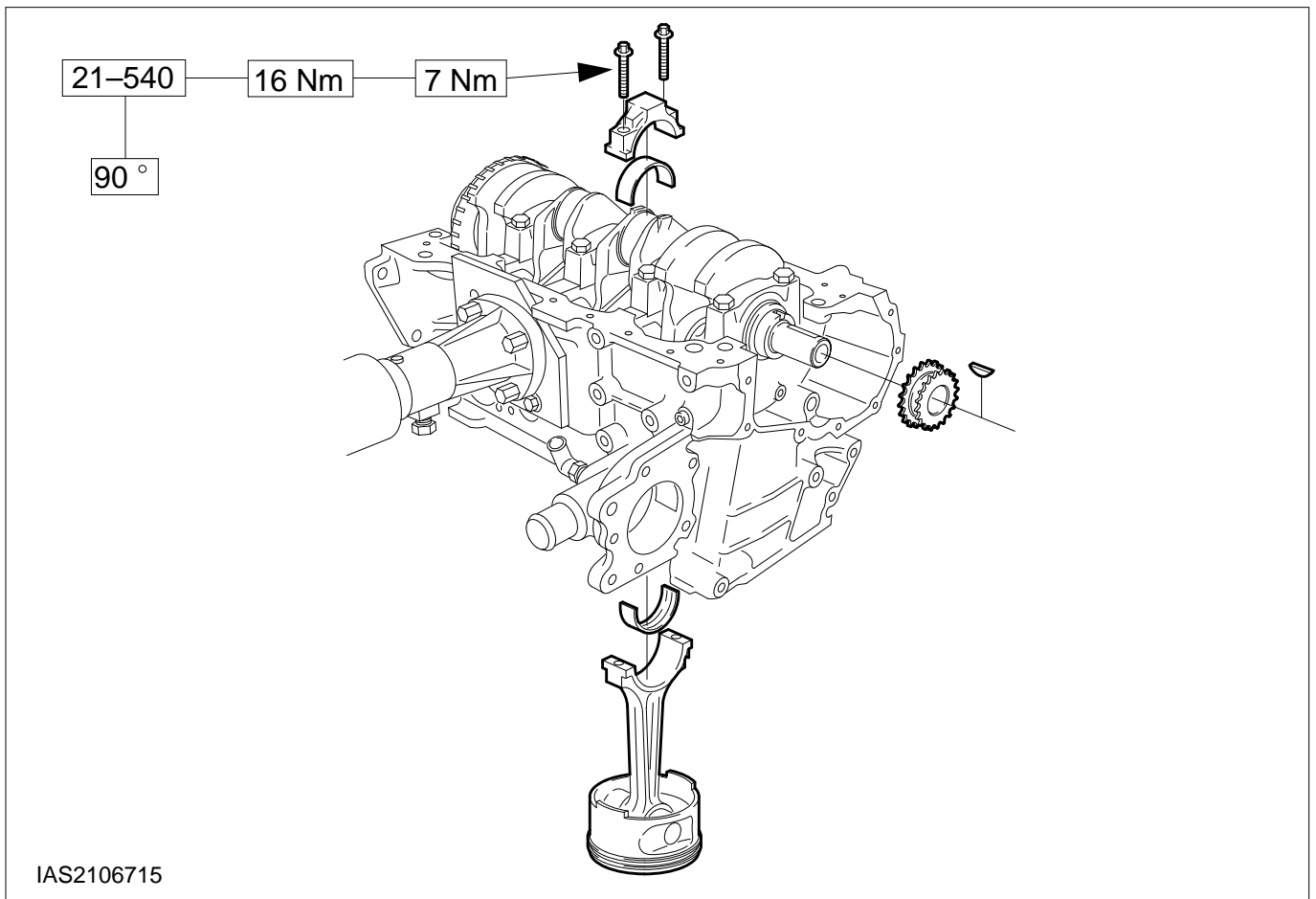
NOTE: Do not damage the running surfaces of the cylinders and bearings.

NOTE: Coat the running surfaces of the cylinders with engine oil.

NOTE: The arrows point to the timing chain end of the engine.

38. Fit the pistons and connecting rods.

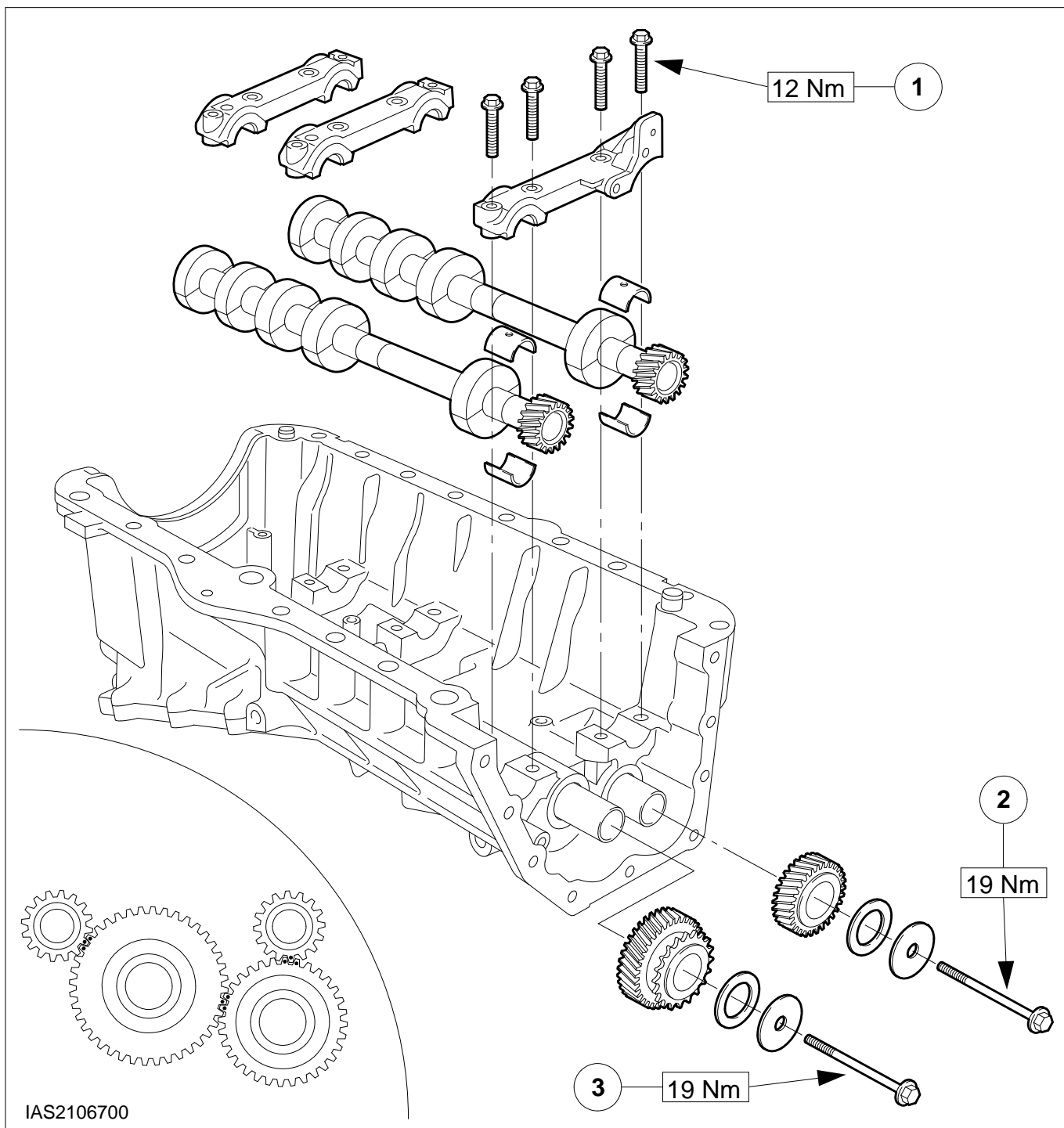
39. Measure the big-end bearing clearance as described in steps 32. to 34.



NOTE: Coat the bearing shells and crankshaft with engine oil.

40. Fit the pistons and connecting rods (cont.)

41. Measure the balancer shaft radial clearance as described in steps 32. to 34.



NOTE: Lubricate the bearing shells and bearing journals with engine oil.

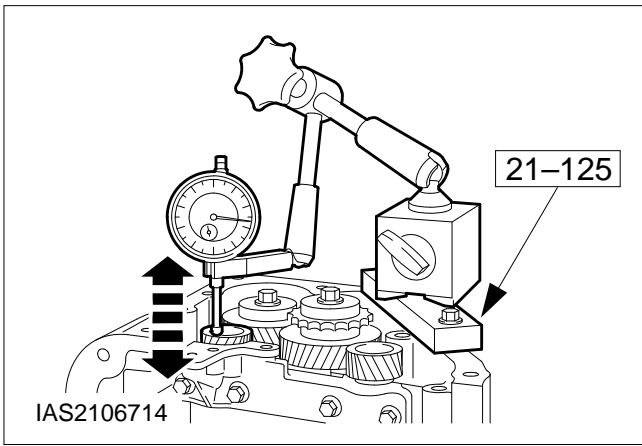
CAUTION: Put the bearing shells which have the holes into the balancer shaft housing and centralise them.

42. Assemble the balancer shaft housing.

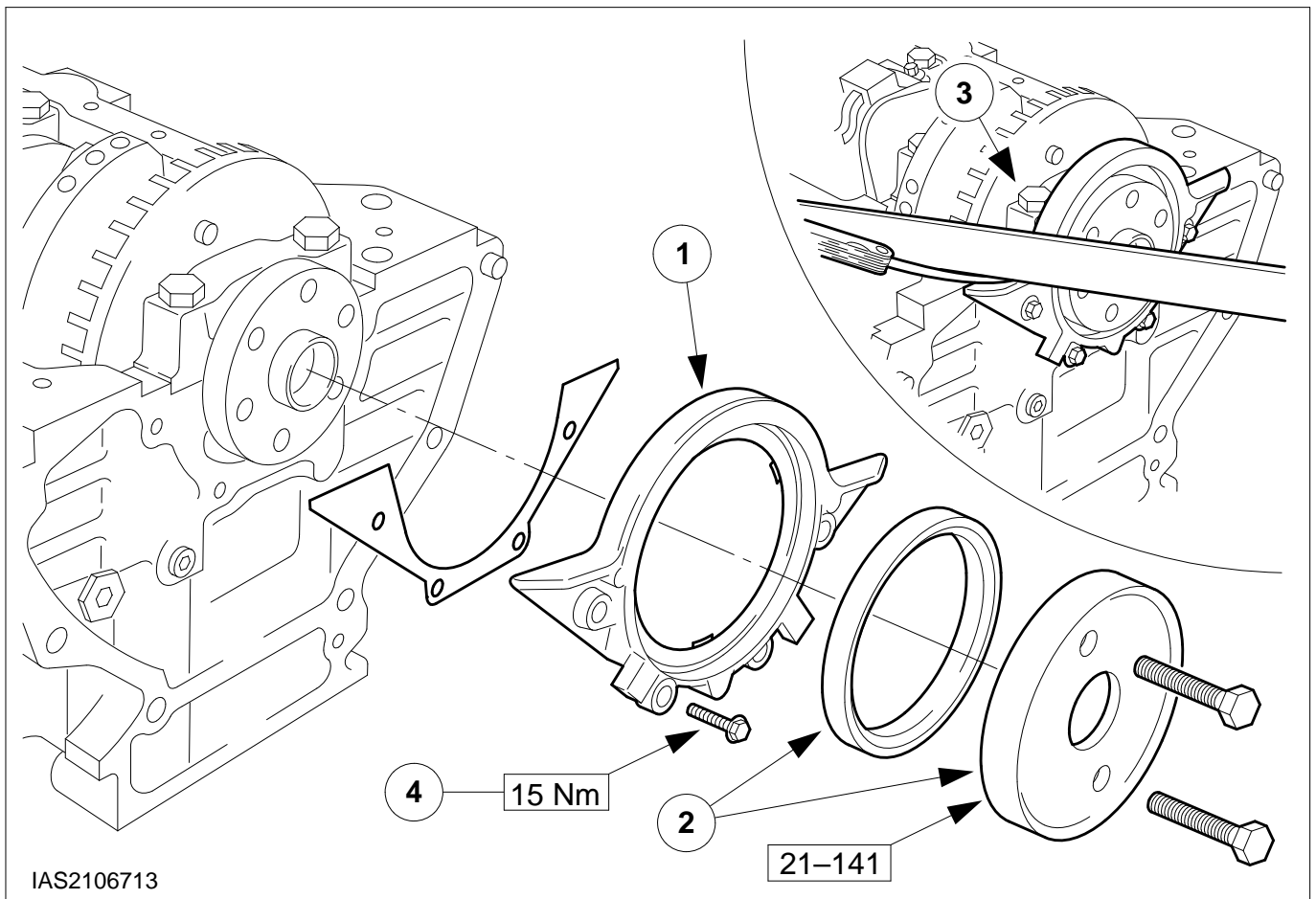
NOTE: The markings on the gear wheels.

1 Install the balancer shafts.

2 Fit the gear wheels.



43. Measure the balancer shaft end float by lifting each one.



44. Install the crankshaft rear oil seal

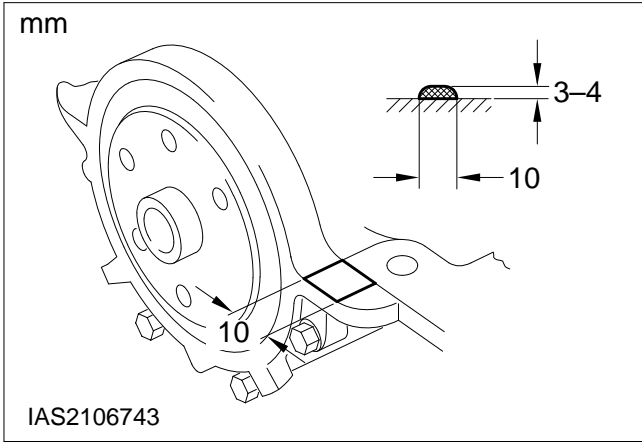
NOTE: Use a new gasket.

NOTE: Do not tighten the bolts yet.

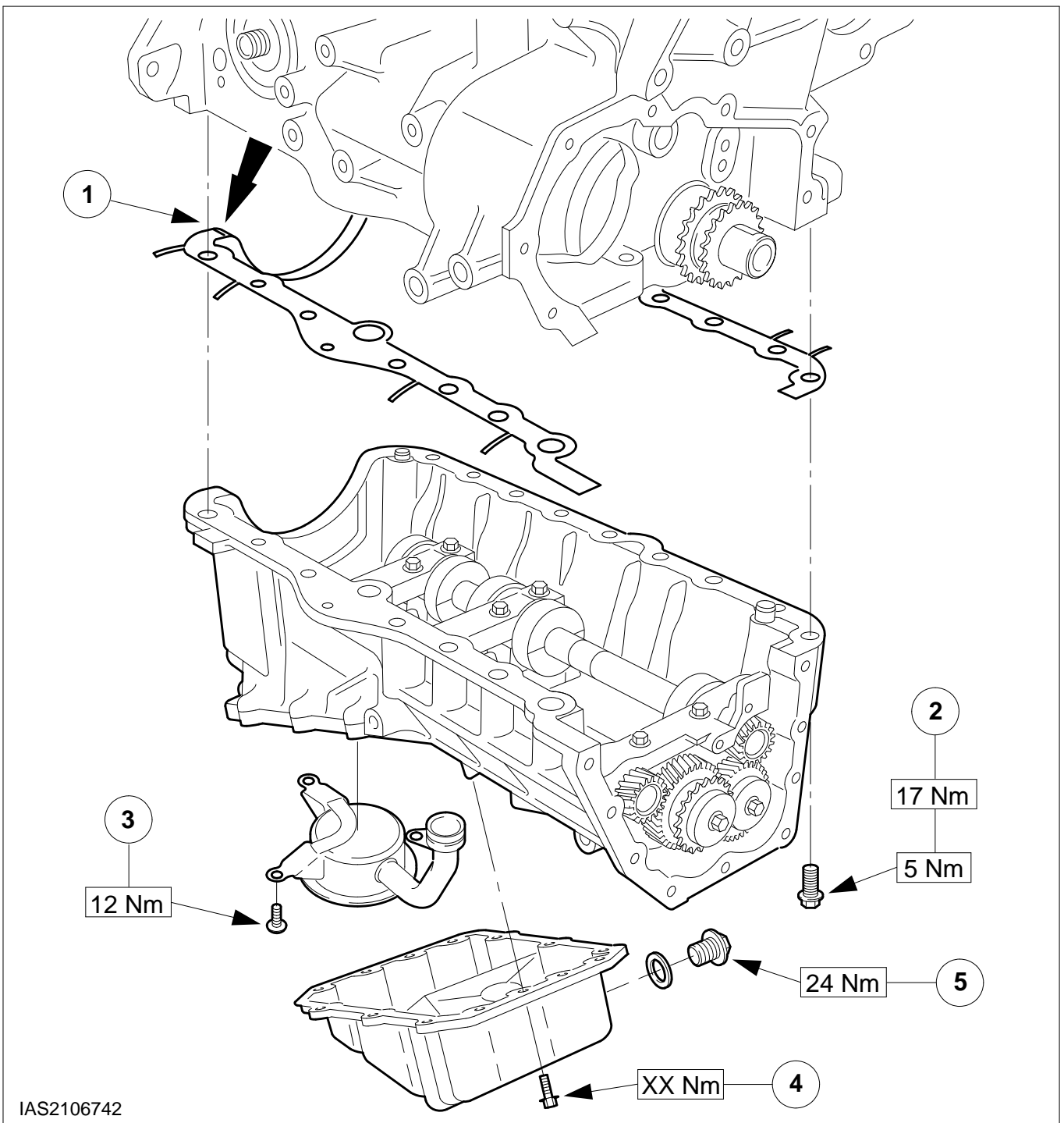
- 1 Put the oil seal carrier, new gasket and bolts in place ready for installation.
- 2 Install the oil seal using the special tool and two vibration damper bolts.

NOTE: The oil seal carrier must not lie flush with the cylinder block.

- 3 Fit the oil seal carrier so that it is proud of the cylinder block by up to 0,46 mm on both sides.
- 4 Tighten the bolts.
Remove the special tool.



45. Apply sealer (WSE-M4G323-A6) to the contact faces of the cylinder block and the oil seal carrier.



46. Fit the balancer shaft housing and sump.

NOTE: Use a new gasket.

⚠ CAUTION: Do not wipe away any sealer which leaks out.

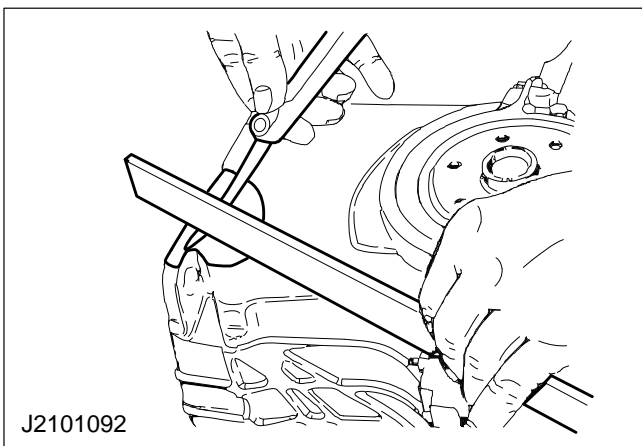
- 1 Lay the gasket in place ready for installation.
 - Press the semi-circular elastomer section into the groove.
 - Hold the gasket in position by bending the tabs.
 - Spread sealer (WSK-M4G-323-A) as described in sub-operation 45. on both metal to elastomer joints on the gasket.
- 2 Install the balancer shaft housing.
- 3 Install the oil intake pipe.
- 4 Fit the sump.

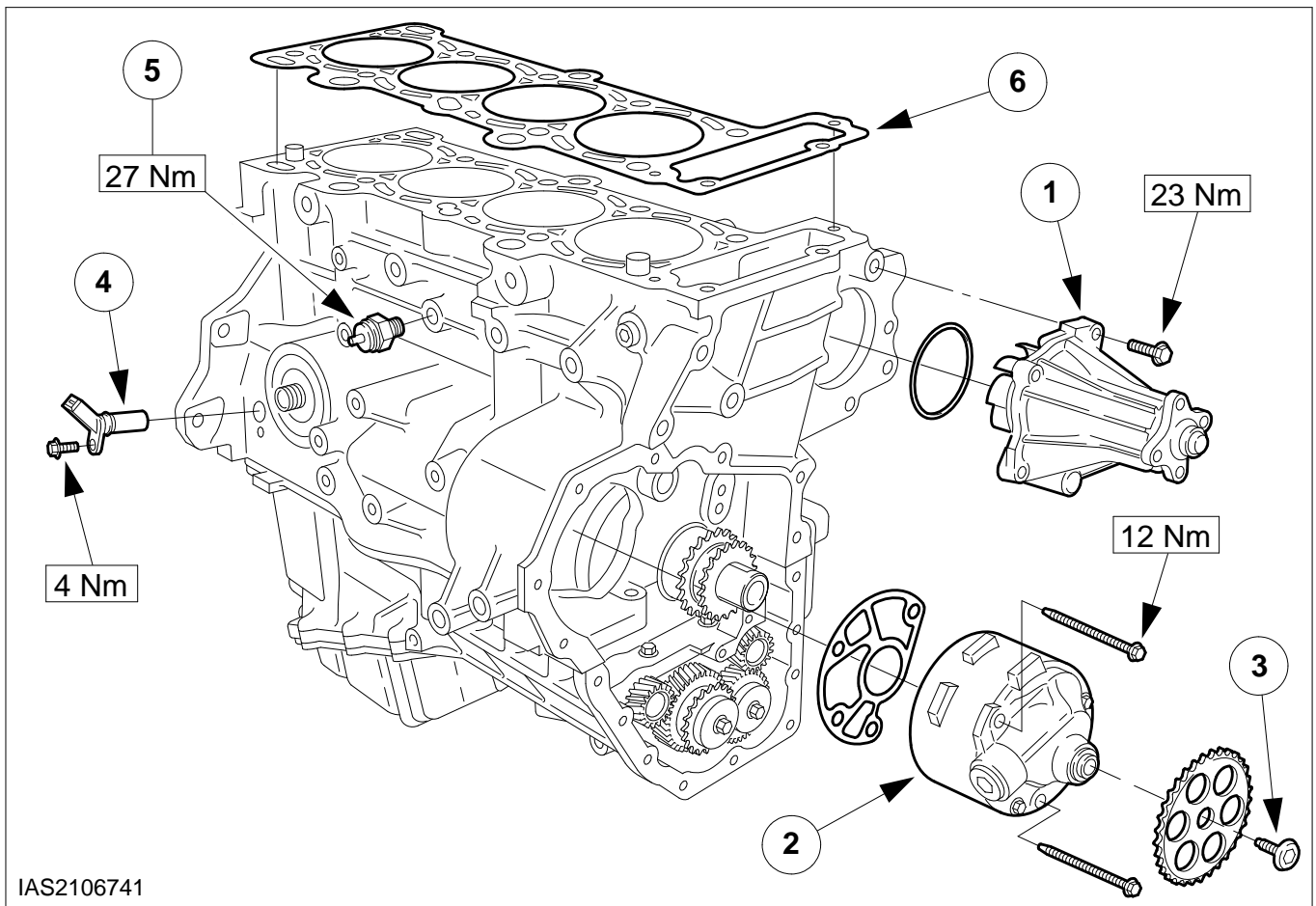
NOTE: Use a new seal.

- 5 Fit the oil drain plug.

NOTE: Bring the surfaces flush using adjustment shims (see General Specifications) when fitting the transmission.

47. Measure the step between the cylinder block and the balancer shaft housing.





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48. Fit the components of the oil and coolant circuits.

NOTE: Use a new seal.

1 Water pump

NOTE: Use a new gasket.

2 Oil pump

NOTE: Do not tighten the sprocket.

3 Oil pump sprocket.

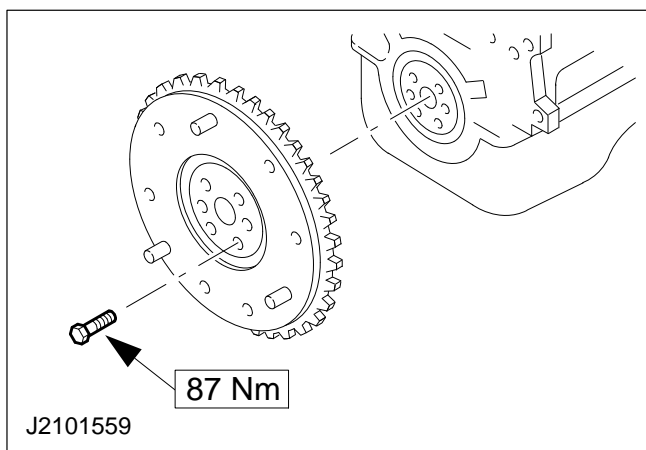
NOTE: Apply lubricant (WSD-M1C226-A) to the seal.

4 CKP sensor.

NOTE: Coat the first three turns of the thread with sealer (WSK-M2G349-A7).

5 Oil pressure switch

6 Lay a new cylinder head gasket in place.

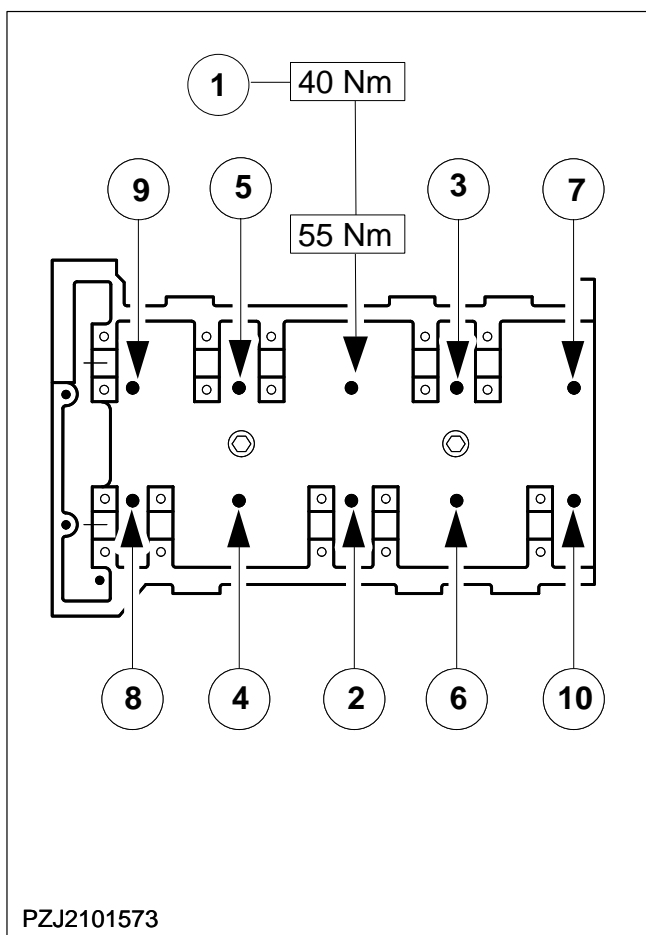


⚠ CAUTION: Use new bolts.

NOTE: There is only one installation position.

49. Fit the flywheel.

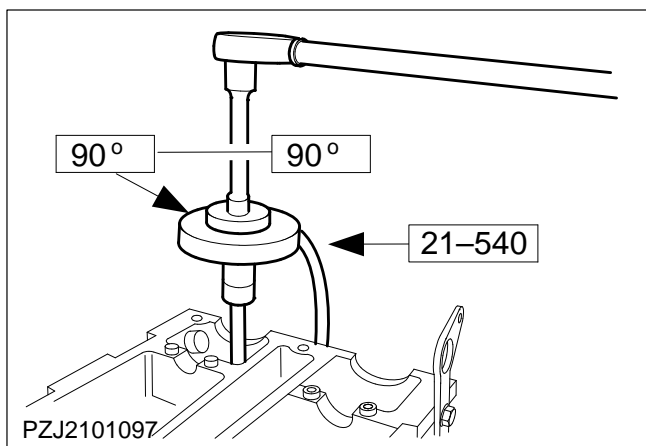
50. Move the crankshaft so that the first cylinder is about 25 mm before TDC.



NOTE: The cylinder head is positively located on the cylinder block by two guide sleeves.

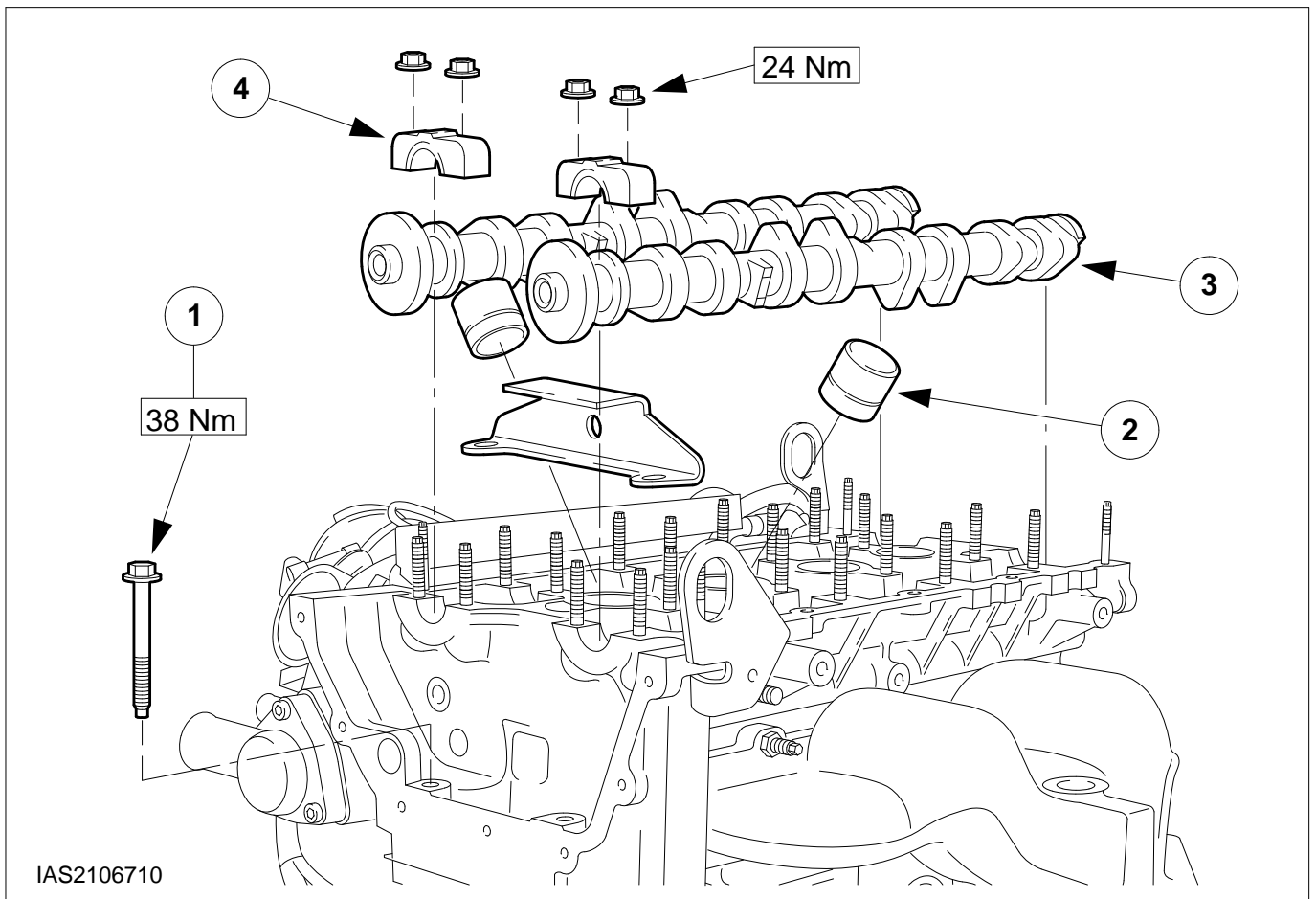
⚠ CAUTION: Use new bolts.

51. Move the cylinder head into position ready for installation and fit it.



⚠ CAUTION: The cylinder head bolts must not be re-torqued.

52. Tighten the cylinder head bolts.



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53. Install the camshafts.

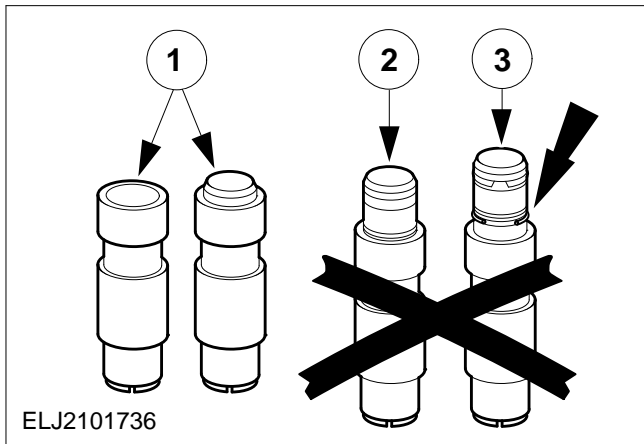
⚠ CAUTION: After tightening the camshafts the crankshaft must not be turned for one quarter of an hour.

NOTE: The intake camshaft has two identification rings between the fourth and fifth cam.

- 1 Put in three cylinder head bolts.
- 2 Coat the hydraulic tappets with engine oil and put them in place.

NOTE: Fit the camshafts so that none of the cams is at full lift.

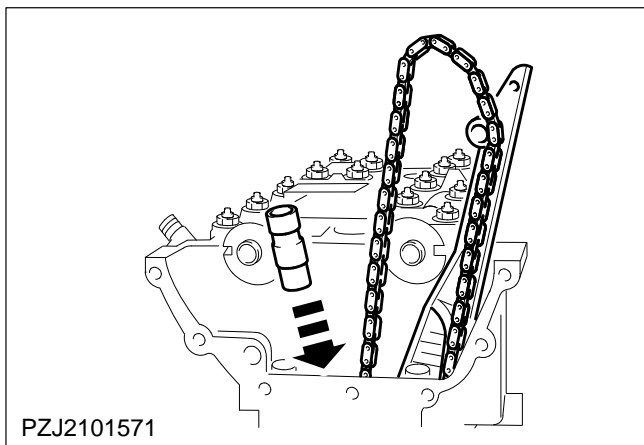
- 3 Coat the camshafts with engine oil and put them in place.
- 4 Put the bearing caps in place and tighten the bolts.



⚠ CAUTION: A fully or partially released plunger (whether new or used) must not be fitted.

54. Check the new chain tensioner plunger.

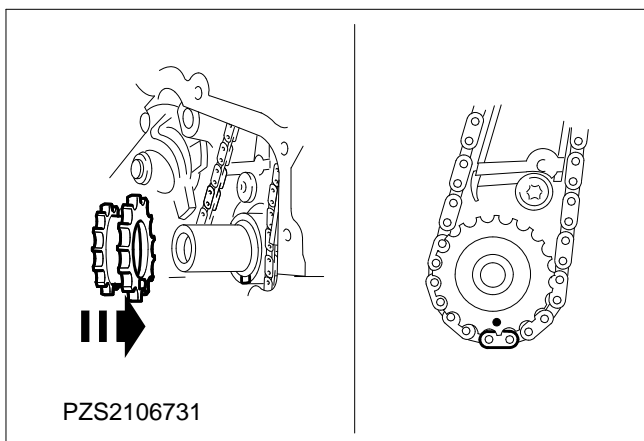
- 1 Plunger latched.
- 2 Plunger partly released.
- 3 Plunger fully released (the detent ring is visible).



55. Install the chain tensioner plunger.

NOTE: The only copper coloured link must be at the bottom of the chain guide.

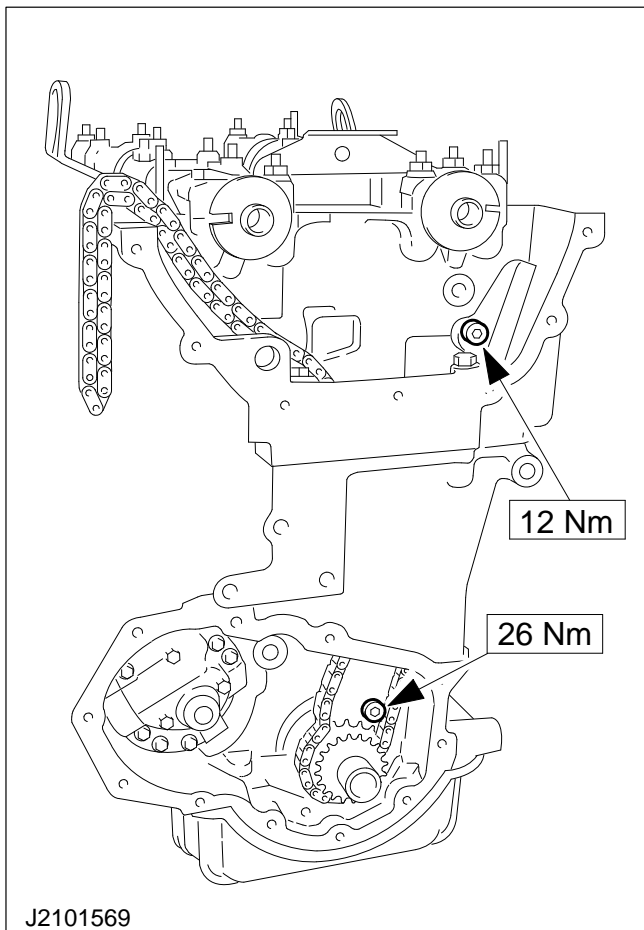
56. Insert the timing chain with the chain guide.



NOTE: The copper link must be across the single mark on the rear sprocket.

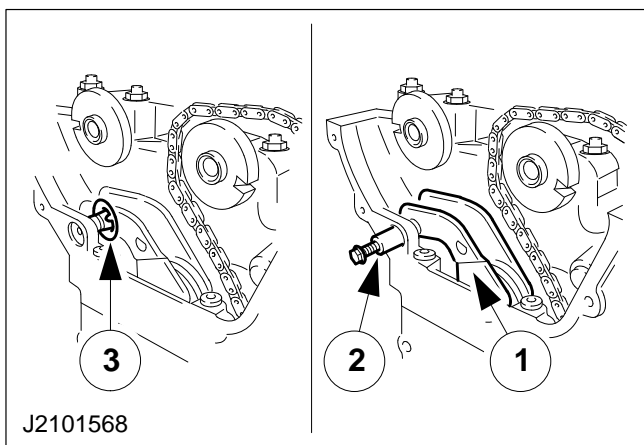
57. Fit the timing chain at the bottom.

- Slide on the sprocket.
- Lay the timing chain around the inner sprocket.
- Fit the Woodruff key in the crankshaft.
- Tie the chain with wire to stop it from slipping into the timing chest.



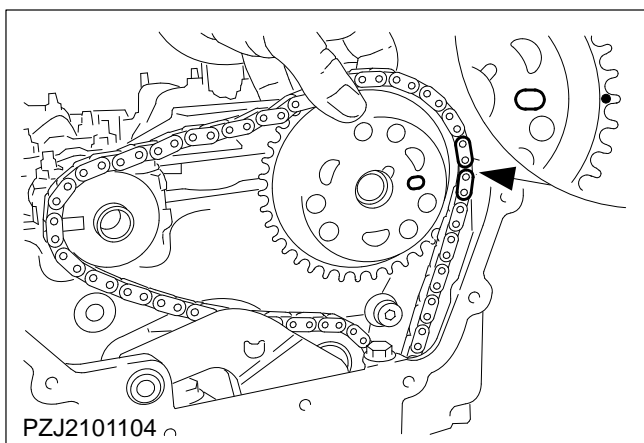
NOTE: Apply thread locking compound (WSK-M2349-A7) to the threads of the lower bolt.

58. Tighten the chain guide bolts (2,0 DOHC 16V shown).



59. Install the chain tensioner.

- 1 Move the chain tensioner into position ready for installation.
- 2 Insert the pin.
- 3 Fit the circlip.

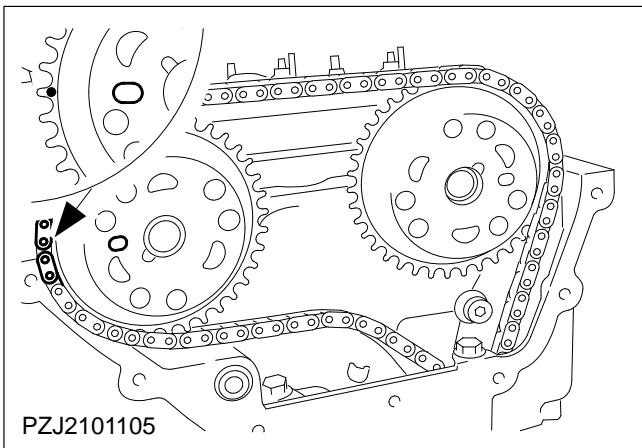


60. Fit the timing chain at the top.

NOTE: The copper coloured chain link must lie directly across the marking on the sprocket.

NOTE: The timing chain must be taut on the long side.

If necessary, turn the camshaft slightly.

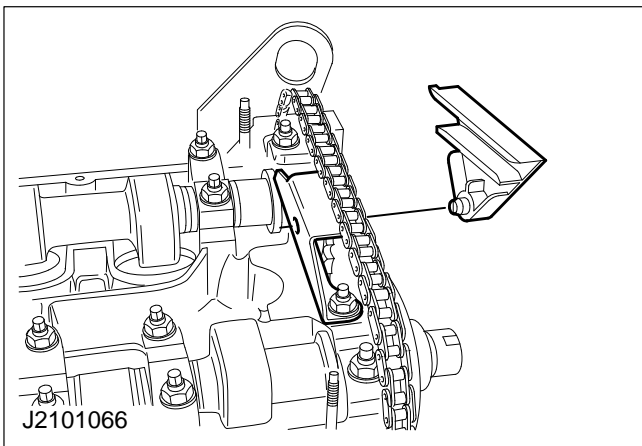


61. Fit the timing chain at the top (continued).

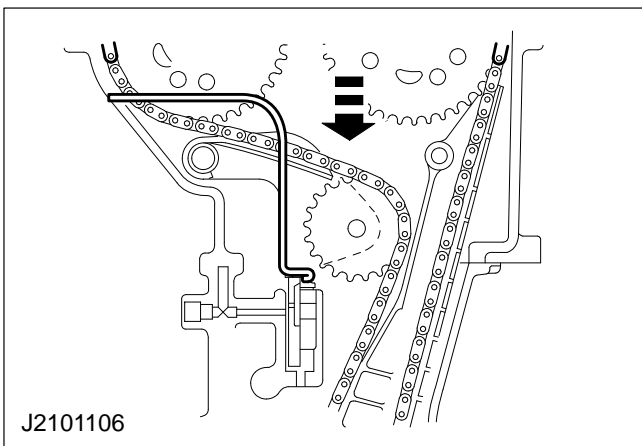
NOTE: The copper coloured link must lie directly across the marking on the sprocket.

NOTE: The timing chain may sag slightly between the camshaft sprockets.

Screw in the bolts of both camshaft timing sprockets.

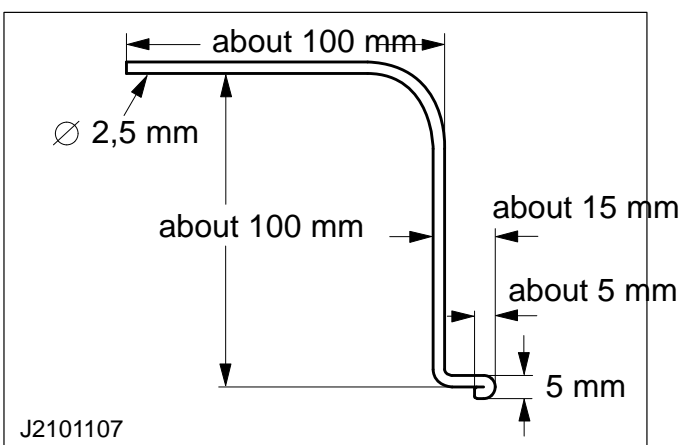


62. Fit a new timing chain upper guide.



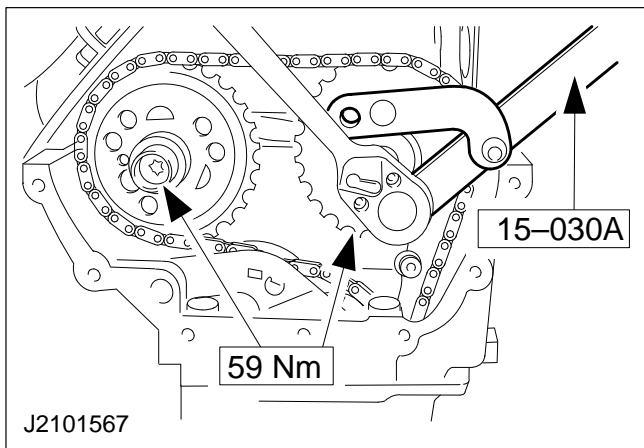
63. Release the chain tensioner plunger.

- Press the chain tensioner arm down by hand and unlatch the oil-filled plunger.
- If the chain tensioner arm does not reach the oil-filled plunger, the plunger must be released using an auxiliary tool.

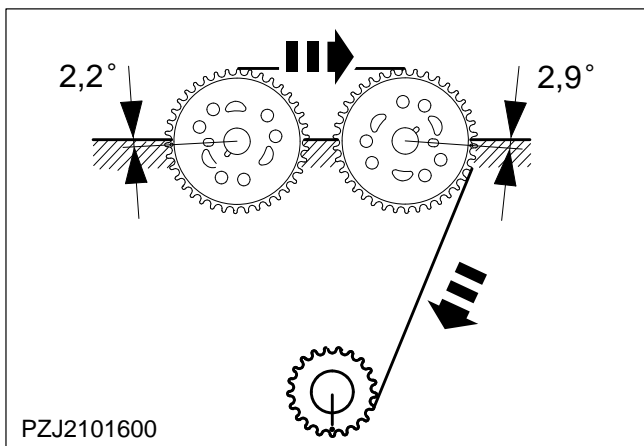


64. Fabricate an auxiliary tool.

Use 2,5 mm diameter welding rod cut to a length of about 220 mm.

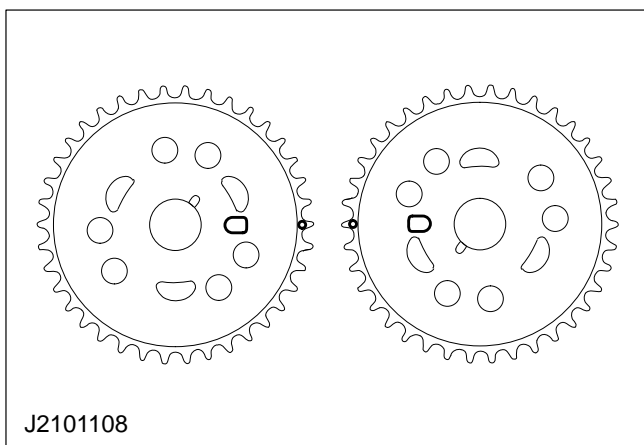


65. Tighten the camshaft sprocket bolts.



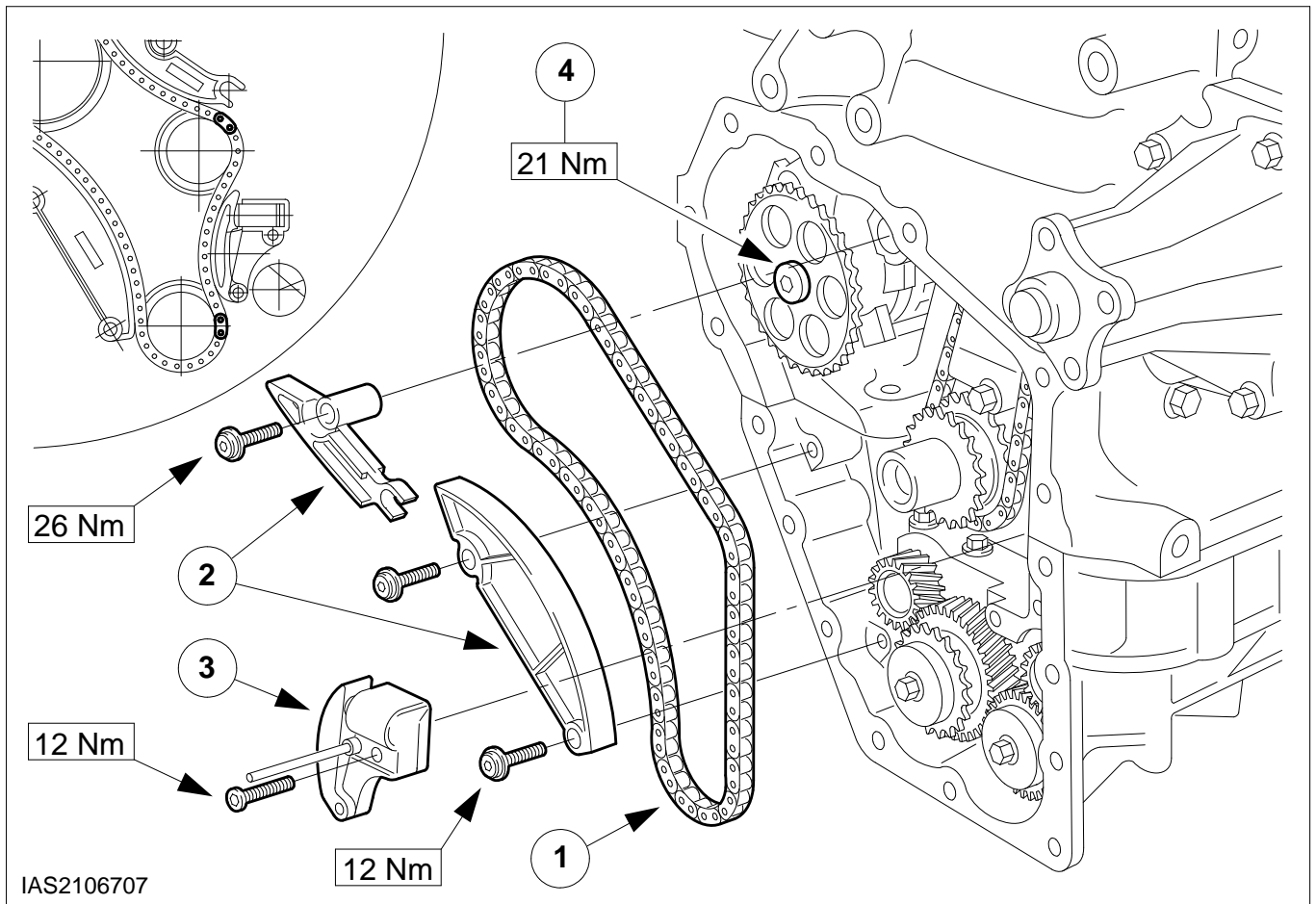
66. Check the valve timing.

- Turn the engine in the normal direction of rotation through two complete revolutions and set it to the markings.
- If it is necessary to correct the valve timing, i.e. release the timing chain, a new oil-filled plunger must also be fitted for the chain tensioner.



67. Check the valve timing (continued).

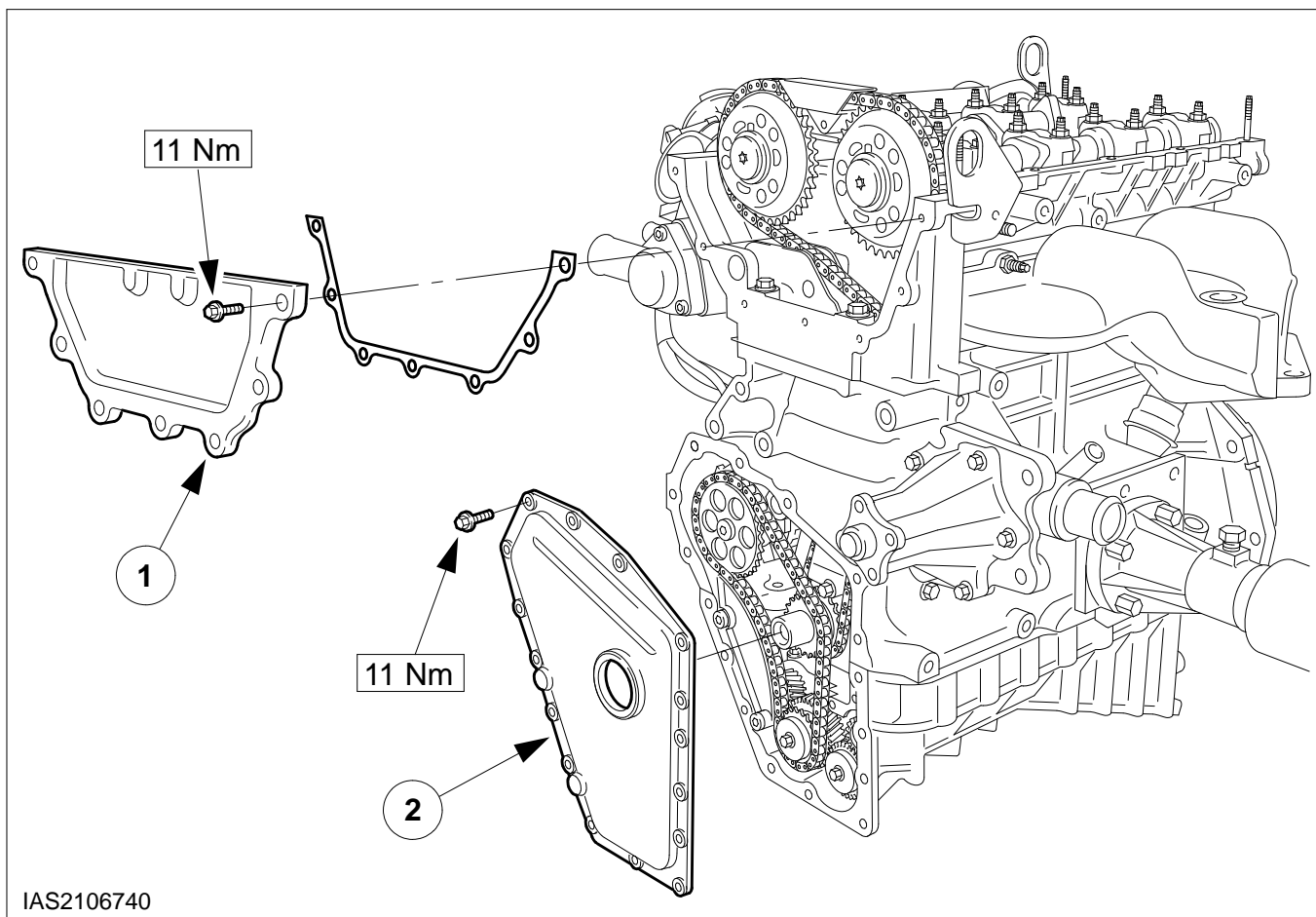
- Turn the crankshaft in the normal running direction until the second cylinder is at TDC.
- The markings on the camshaft sprockets must be opposite one another on the level of the top edge of the cylinder head.



68. Fit the oil pump chain drive.

NOTE: The copper coloured links must be across the markings on the crankshaft sprocket and the balancer shaft sprocket. To do this turn the crankshaft so that the second cylinder is at TDC.

- 1 Chain
- 2 Chain guide
- 3 Fit the chain guide and pull out the twist drill.
- 4 Tighten the oil pump sprocket bolt.



NOTE: Use new gaskets.

69. Fit the timing chain cover.

NOTE: The top edge must lie flush with the cylinder head top edge.

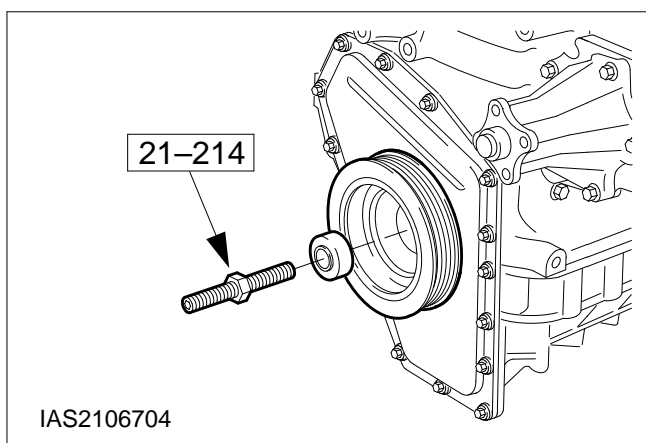
1 Upper timing chain cover

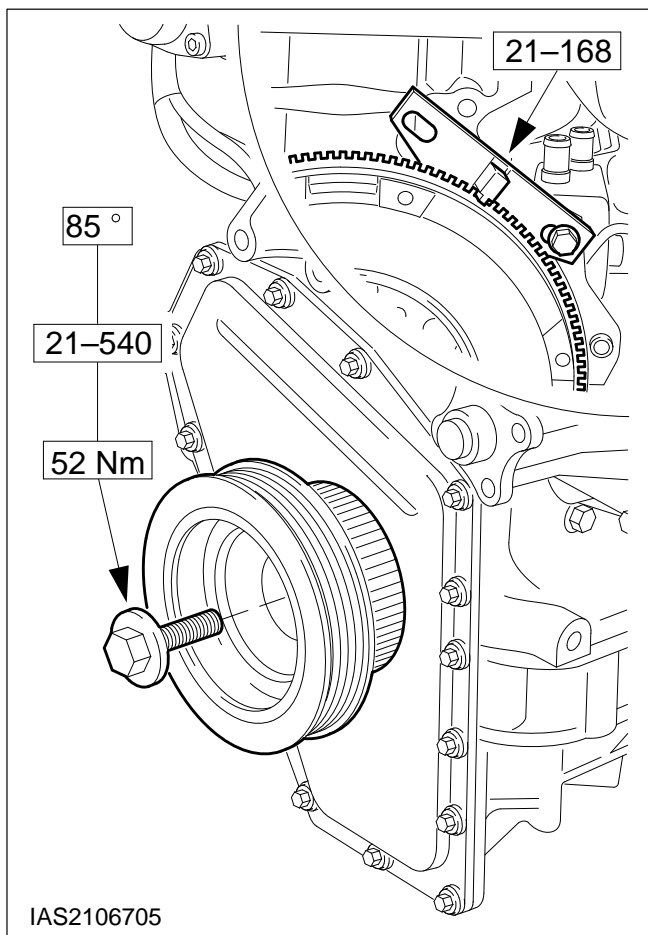
NOTE: Take out the centring cap after tightening the bolts.

2 Lower timing chain cover.

Tighten the cover bolts.

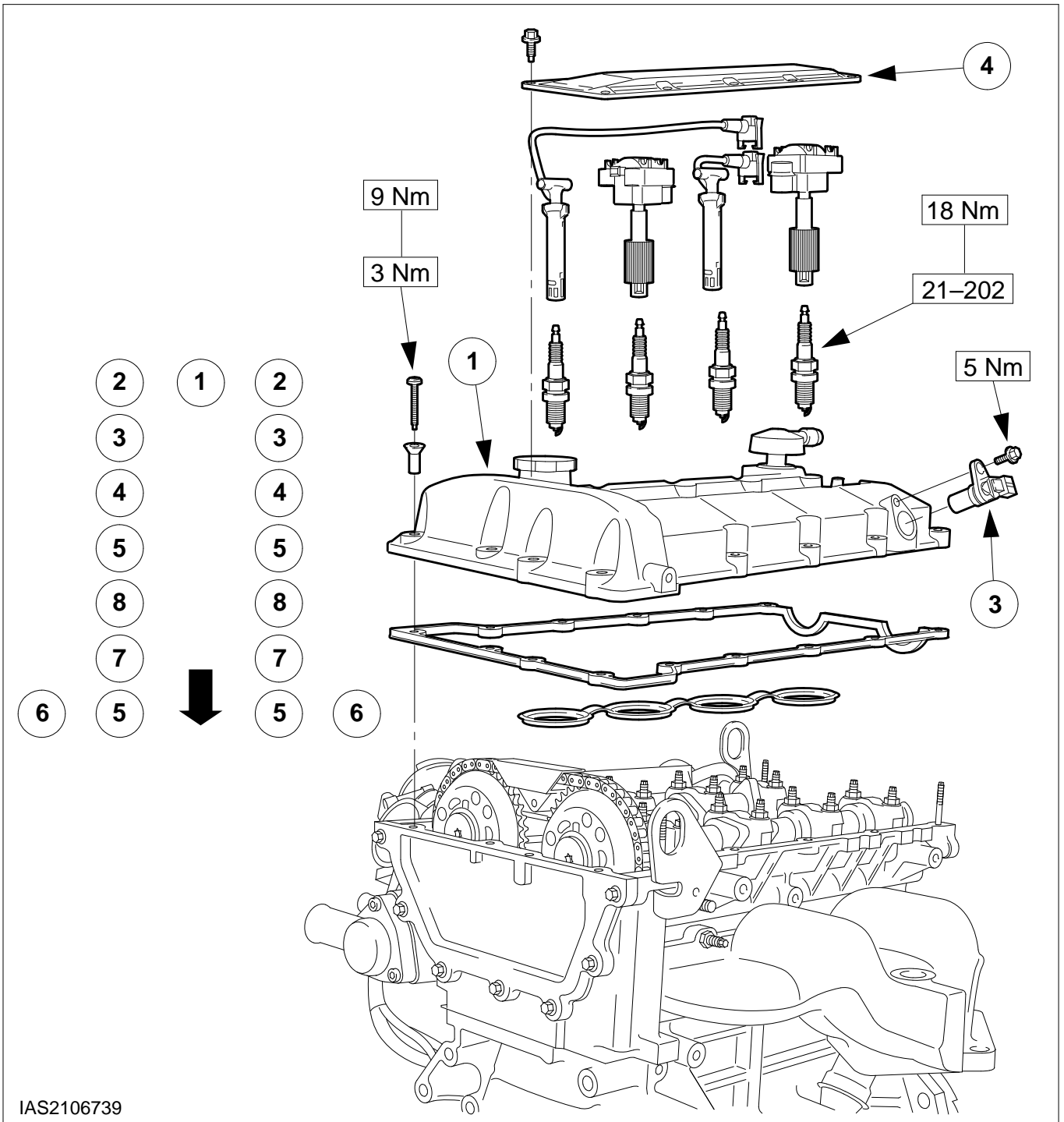
70. Press on the vibration damper.





NOTE: Lock the crankshaft

71. Tighten the vibration damper bolt.



NOTE: Use new gaskets.

72. Fit the cylinder head cover.

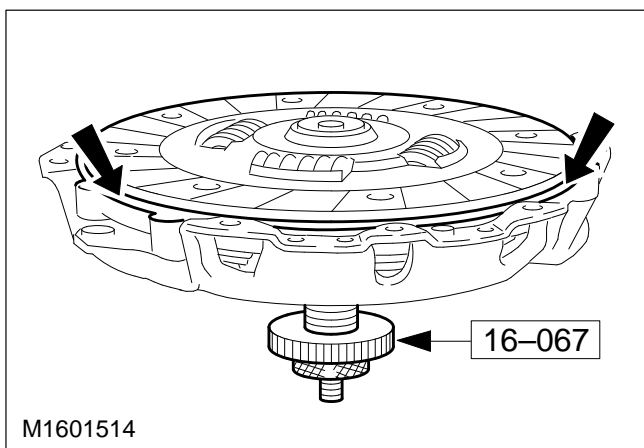
NOTE: Bolt-tightening sequence.

- 1 Fit the cylinder head cover.

NOTE: Apply lubricant (ESE-M1244-A) to the spark plug threads.

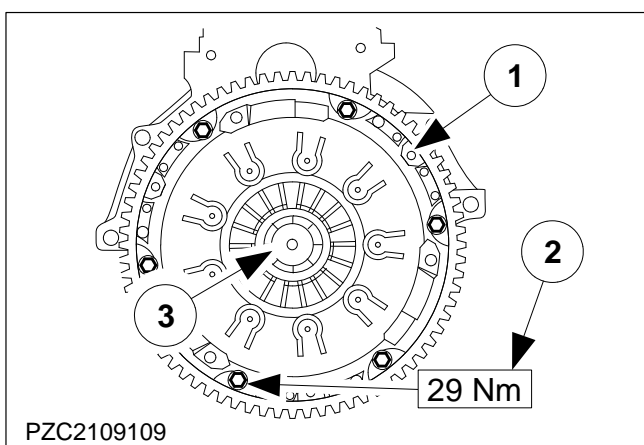
- 2 Fit the spark plugs, ignition coils and ignition cables.
- 3 Fit the CMP sensor and connector.
- 4 Fit the ignition coil cover.

73. Centre the clutch disc.



74. Secure the clutch.

- 1 Put the clutch pressure plate and the centralised clutch disc in position ready for installation.
- 2 Tighten the bolts uniformly, working diagonally.
- 3 Remove the special tool.



75. Finishing operations.

- Attach the oil filter.
- Fill up with engine oil.
- Detach the engine from the assembly stand.