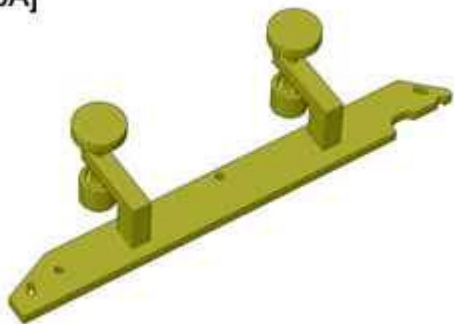





REMOVING - REFITTING : CAMSHAFTS

URGENT : Observe the safety and cleanliness recommendations ⓘ .

1. Tooling

tool	Reference	Designation
<p>[0197-3A]</p>  <p>Figure : E5AB064T</p>	[0197-3A]	Camshaft locking tool
<p>[0197-3B1]</p>  <p>Figure : E5AB065T</p>	[0197-3B1]	Spring compression clamp
	[0197-3B2]	Tool for holding on vice

<p data-bbox="172 233 326 268">[0197-3B2]</p>  <p data-bbox="172 600 337 625">Figure : E5AB066T</p>		
<p data-bbox="172 749 310 785">[0197-3C]</p>  <p data-bbox="172 1119 337 1144">Figure : E5AB067T</p>	<p data-bbox="797 688 906 714">[0197-3C]</p>	<p data-bbox="932 688 1045 714">Fitting tool</p>

2. Identification

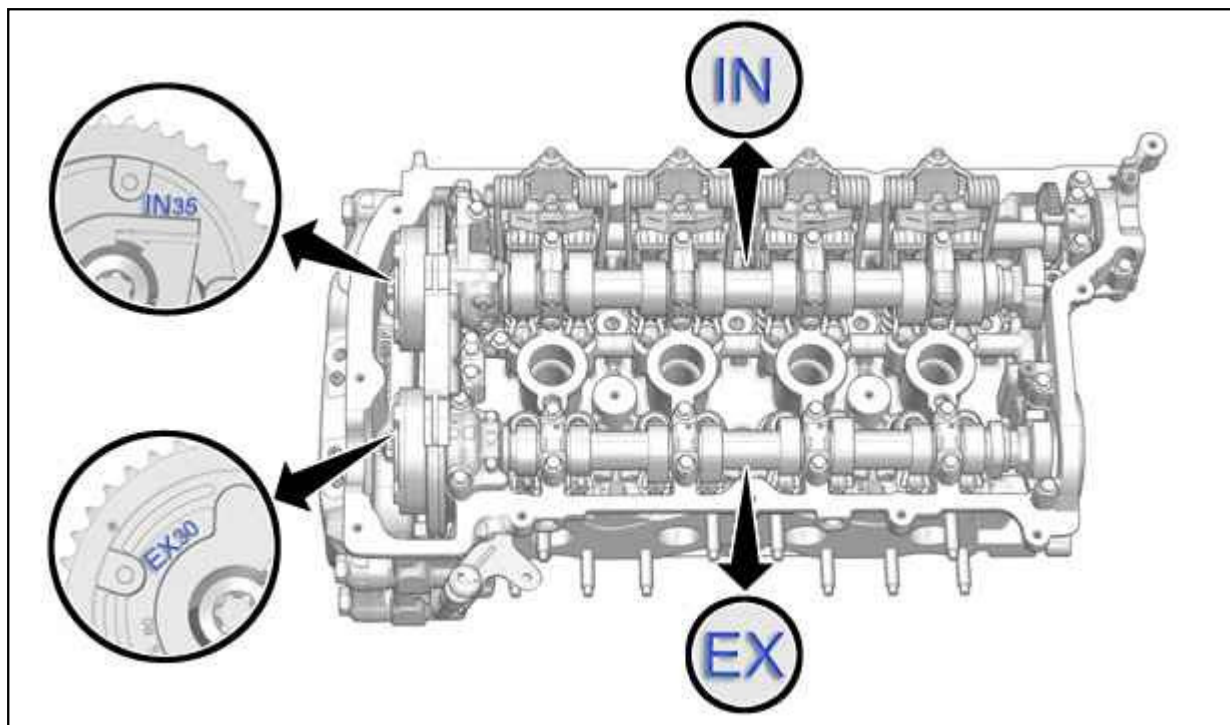


Figure : B1EG0CRD

CAUTION : Mark the positions of the pulleys and the camshafts .

CAUTION : The two camshafts and the two camshaft pulleys have different markings.

IN : Inlet.
EX : Exhaust.

CAUTION : Do not mix up the camshafts and their camshaft pulleys ; Risk of destruction of the engine.

3. Exhaust camshaft

3.1. Removing

Place the vehicle on a two-post ramp.
Disconnect the battery.
Remove the exhauster .
Adjust the timing.

CAUTION : The chain tensioner has to be removed.

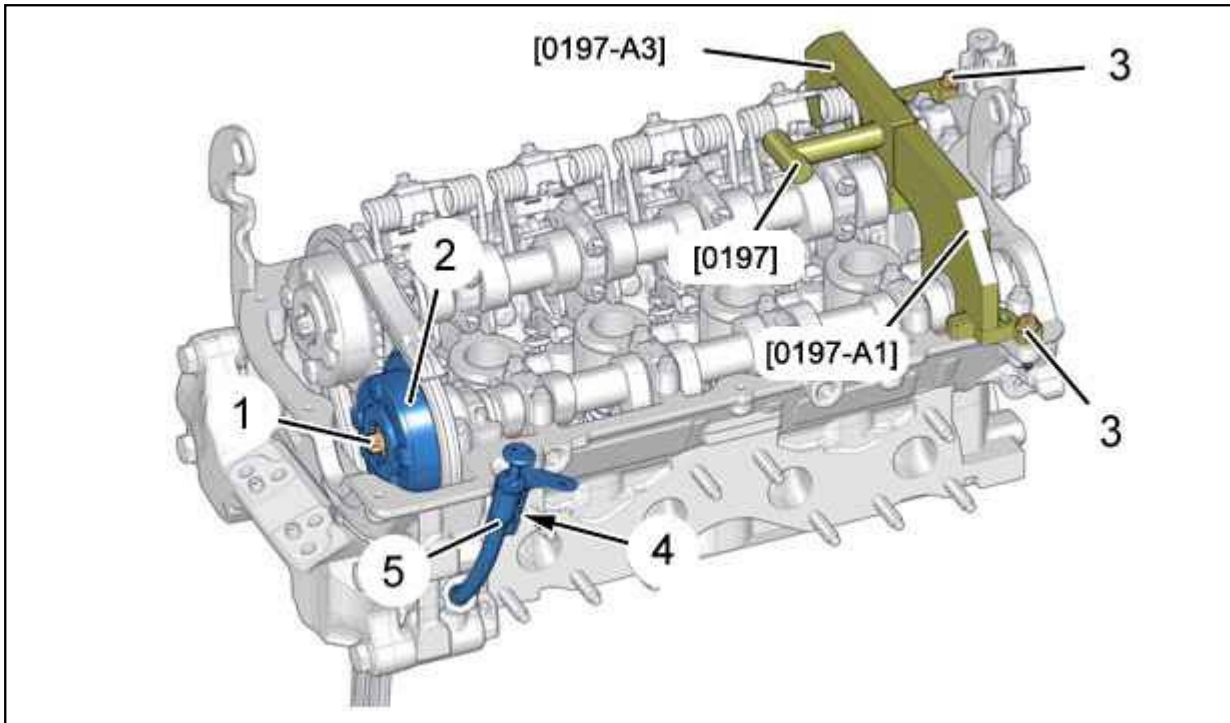


Figure : B1EG0CSD

Remove bolts (1).

Release : The exhaust camshaft pulley (2).

Remove :

- The (4) bolt
- The pick-up unit (5)
- The bolts (3)
- The camshaft setting tool [0197]

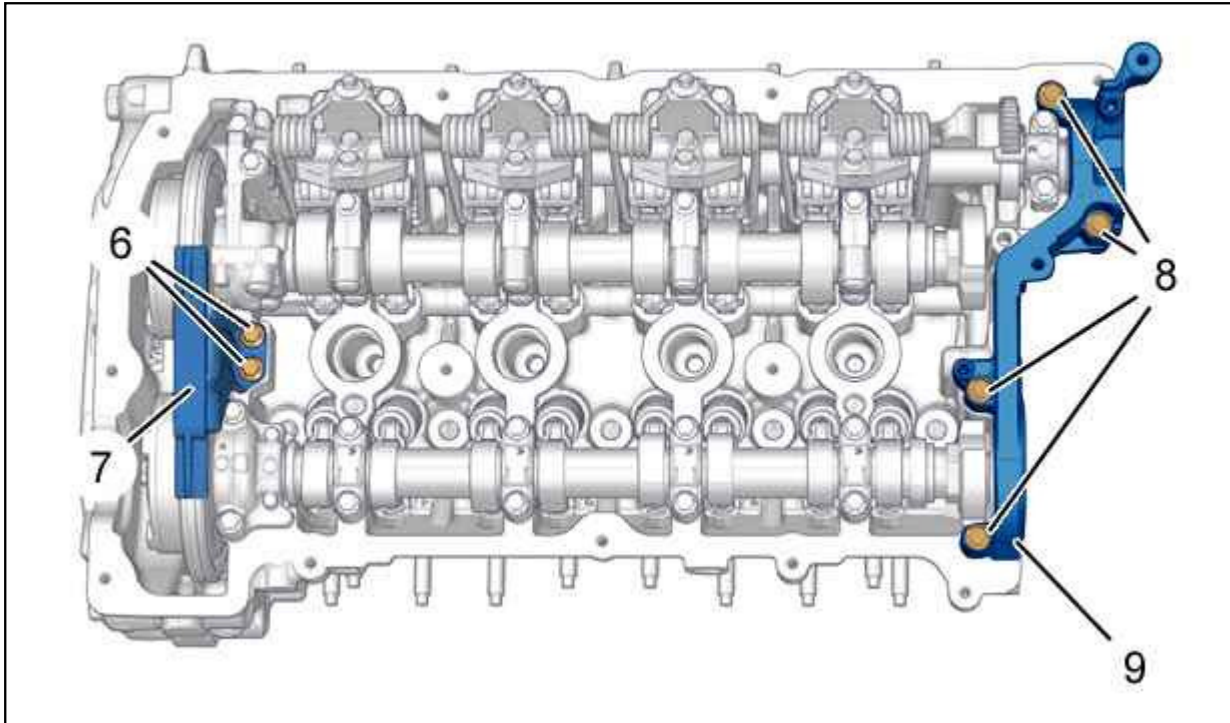


Figure : B1DG07HD

CAUTION : Do not remove the screws (8) from the camshafts double bearing (9).

Remove :

- The bolts (6)
- The timing chain anti-knock pad (7)

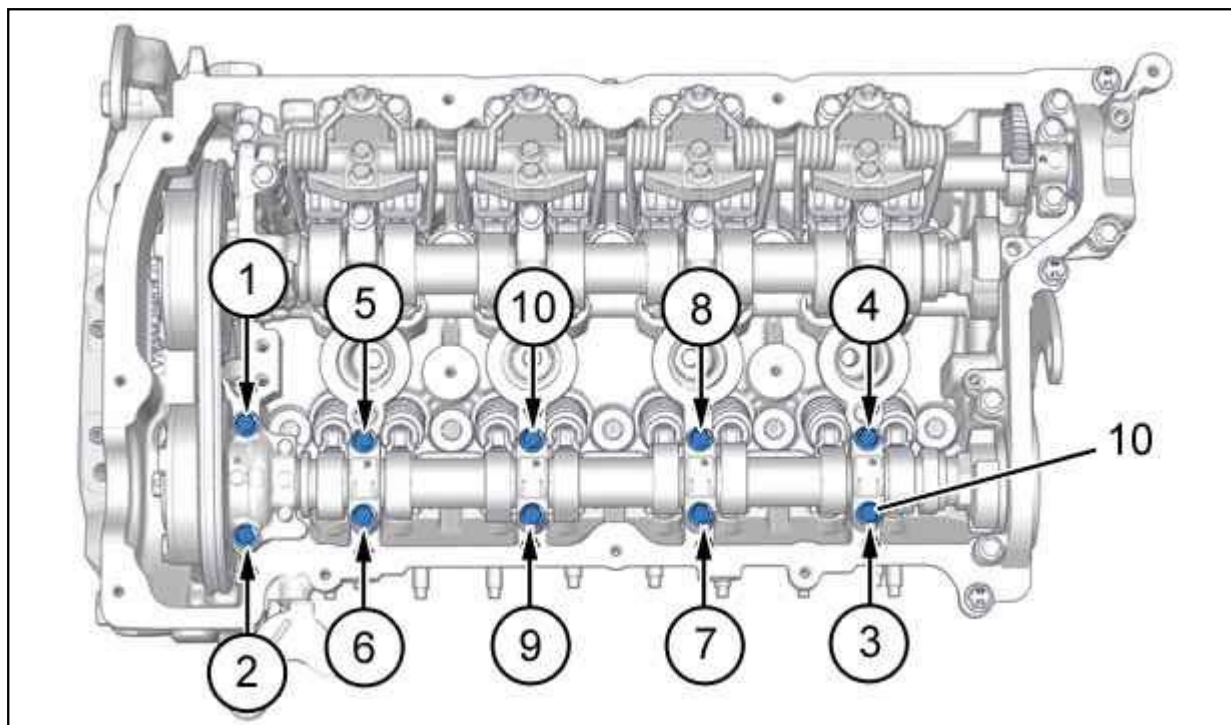


Figure : B1DG07ID

CAUTION : Observe the order of slackening indicated.

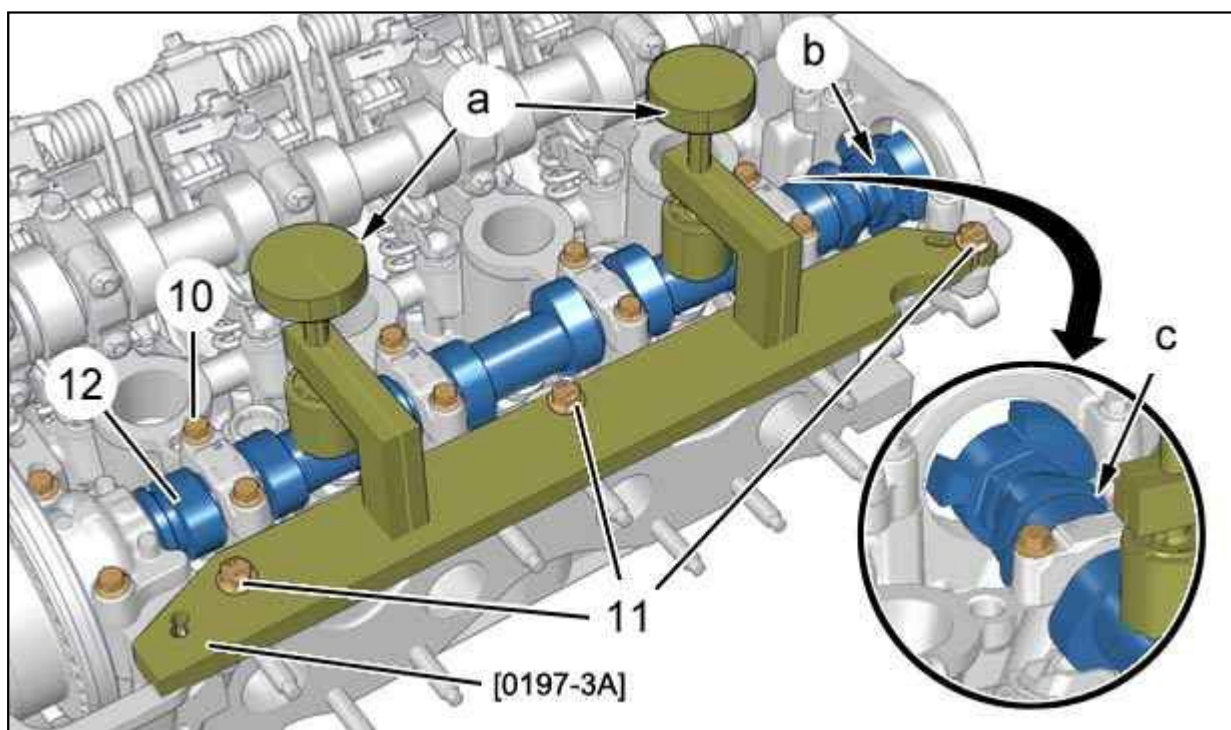


Figure : B1DG07JD

CAUTION : Do not remove the screws (10) from the camshafts bearing without using the camshaft locking tool

[0197-3A].

CAUTION : Rotate the exhaust camshaft (12) clockwise by about 30° (as "b") ; The upper surface of the cam "c" should be inclined by around 30°.

Fit :

- The tool [0197-3A]
- The bolts (11)

Tighten the controls "a" to retain the exhaust camshaft in its housing (12).

Remove the bolts (10).

Mark : The camshaft bearing caps .

Slacken the controls "a" on the tool [0197-3A].

Remove :

- The bolts (11)
- The tool [0197-3A]
- The camshaft bearing caps ; Mark
- The exhaust camshaft (12)

If the rockers and hydraulic tappets are to be removed : Mark (Before removal) :

- The location of the rockers
- The location of the hydraulic tappets

3.2. Refitting

CAUTION : Adhere to the tightening torques  .

CAUTION : Do not use sharp or abrasive tools. The seal faces should not show any traces of impacts or scratches. Clean the cylinder head cover joint faces .

CAUTION : The camshaft surfaces, camshaft bearings and sealing rings must not bear any signs of knocks or scratches.

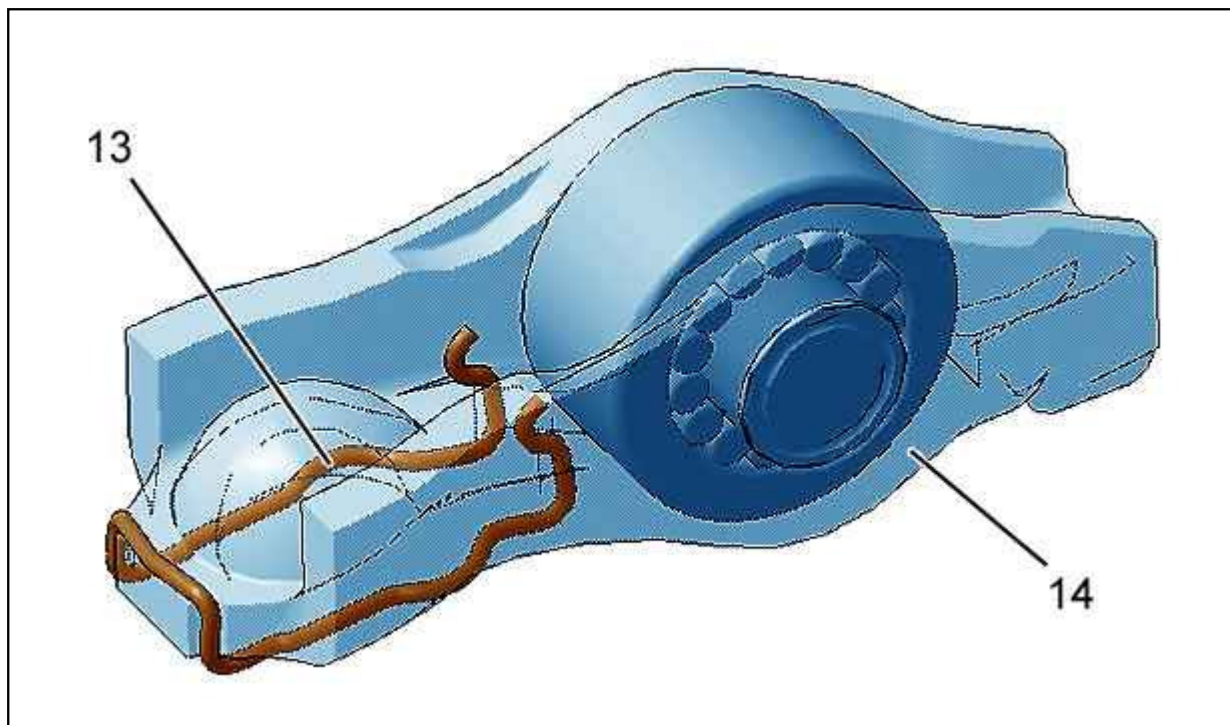


Figure : B1DG07KD

Check the presence of the clips (13) on the roller rockers (14).

CAUTION : The clip (13) must not be distorted in any circumstances ; A clip that is distorted, even very slightly, risks not being able to hold the roller rocker (14) on the hydraulic tappet.

Oil the body of the hydraulic tappets (With clean engine oil).

Fit : The hydraulic followers (Observe their original location).

Check that the hydraulic tappets rotate freely in the cylinder head.

CAUTION : Observe their original location.

Refit the roller valve rockers (14) fitted with their clip (13).

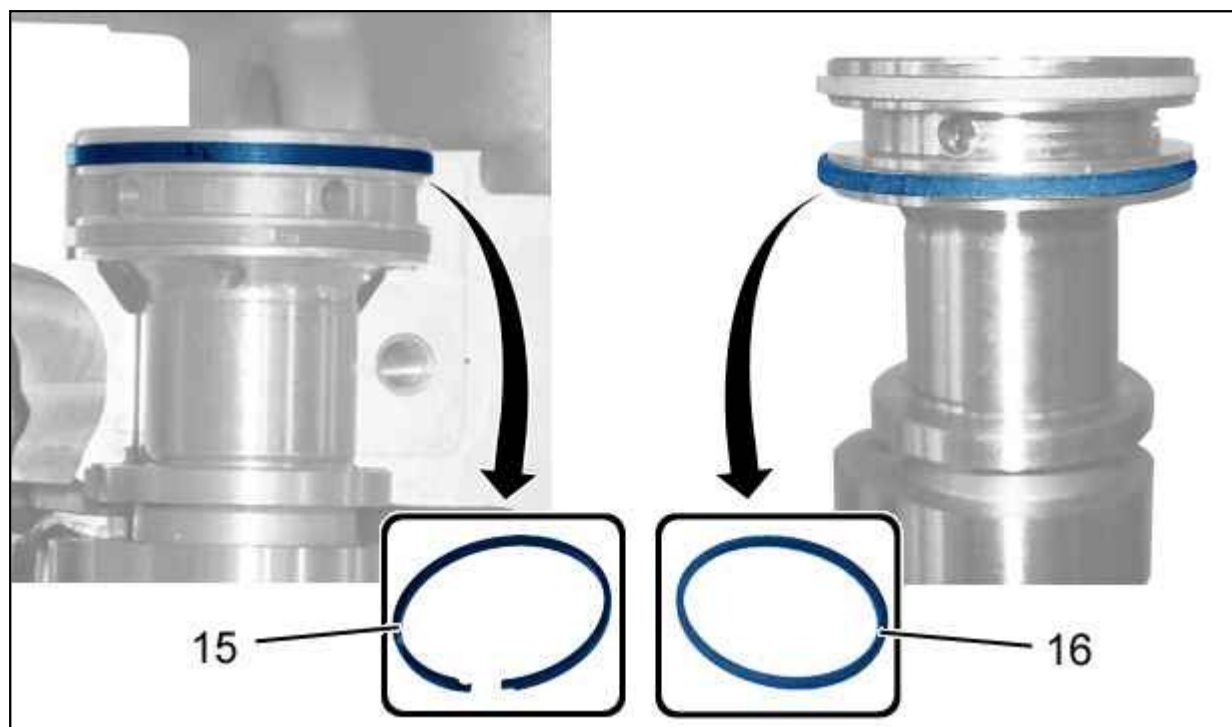


Figure : B1DG0EZD

CAUTION : Always replace : The camshaft seals .

Replace the old type metal ring seals (15) with the new ring seals PTFE (16).
Do not scratch either the grooves or the shoulders when removing the metal ring seals.
Do not oil the ring seals PTFE (16) prior to fitting.

CAUTION : Check that the seal has not turned over in its groove, rotate the seals a few times in their grooves to make sure they are correctly in place and there are no tight spots.

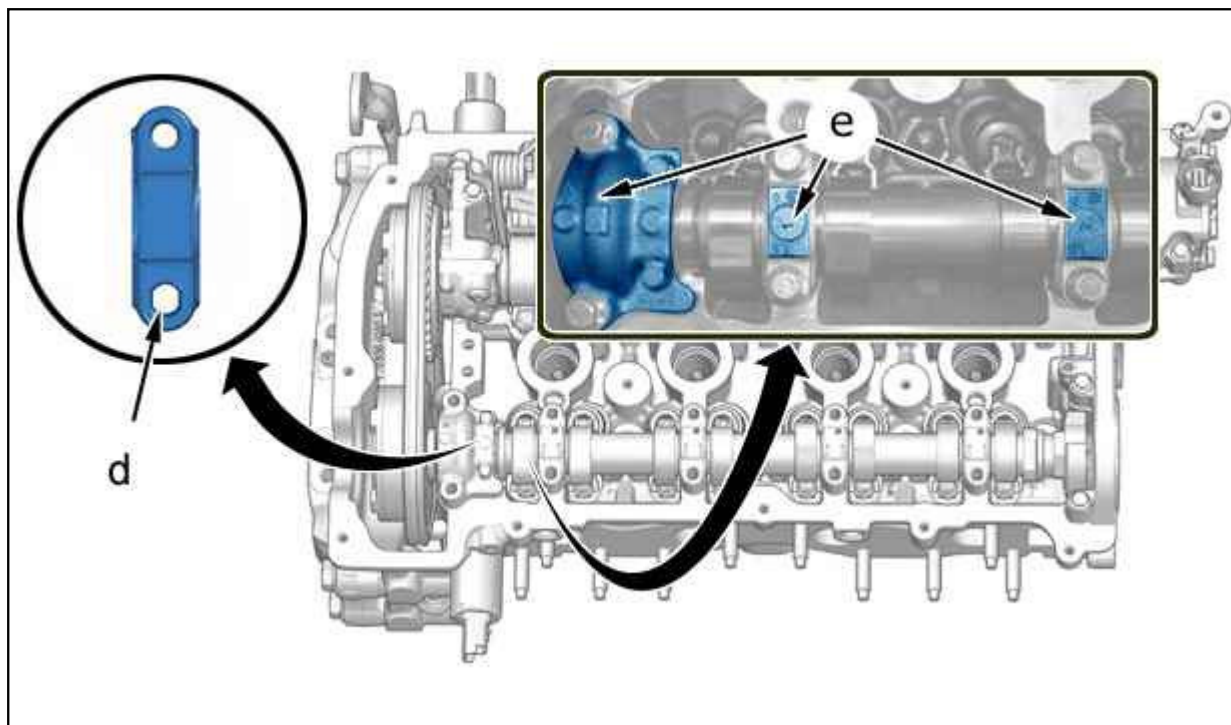


Figure : B1DG0F0D

Clear the oil from the threads receiving the camshaft bearing cap fixing bolts.

CAUTION : Take note of the markings on the camshaft bearings (as "e") ; From 0 to 4.

Oil the camshaft bearings (With clean engine oil).

CAUTION : Orient the oblong slot bearings (as "d") Outwards.

Fit :

- The exhaust camshaft (12)
- The camshaft bearing caps

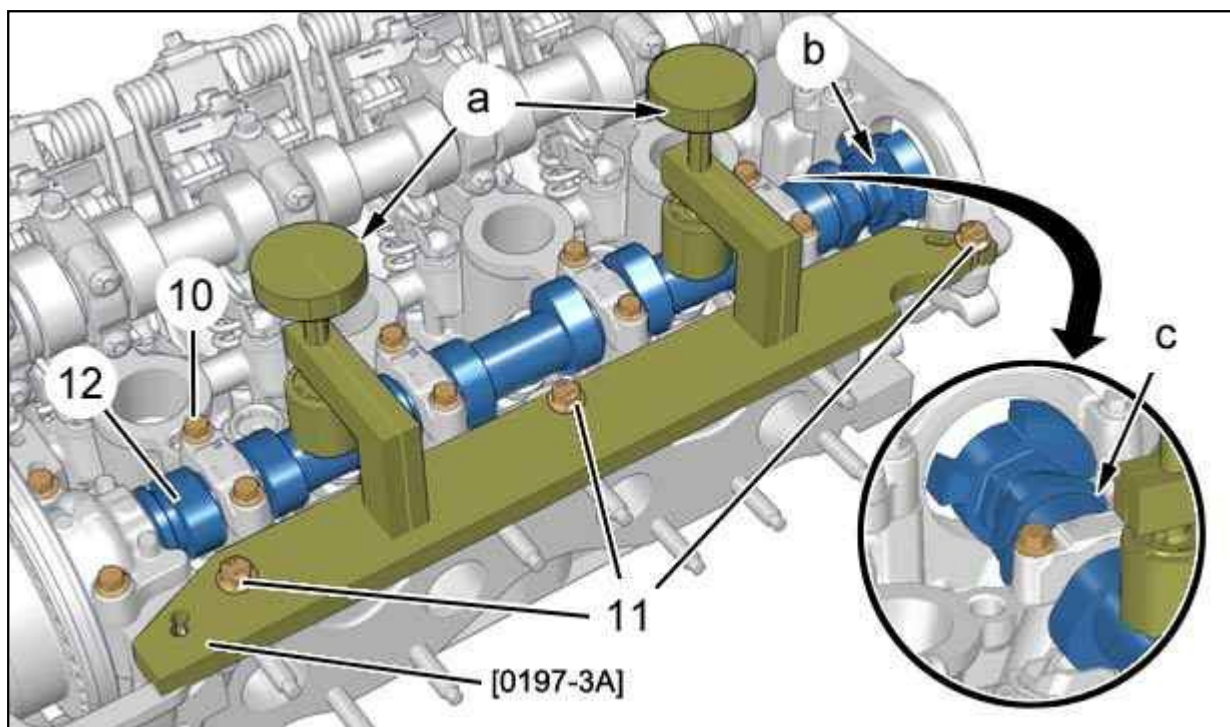


Figure : B1DG07UD

CAUTION : Do not refit the bearings without using the tool [0197-3A] ; Risk of destruction of the camshaft bearings and bearing threads.

N.B. : Slacken the controls "a" on the tool [0197-3A].

CAUTION : Rotate the exhaust camshaft (12) clockwise by about 30° (as "b") ; The upper surface of the cam "c" should be inclined by around 30°.

Fit :

- The tool [0197-3A]
- The bolts (11)

Tighten the controls "a" to retain the exhaust camshaft in its housing (12).
Refit the bolts (10) ; Tighten to the specified torque.

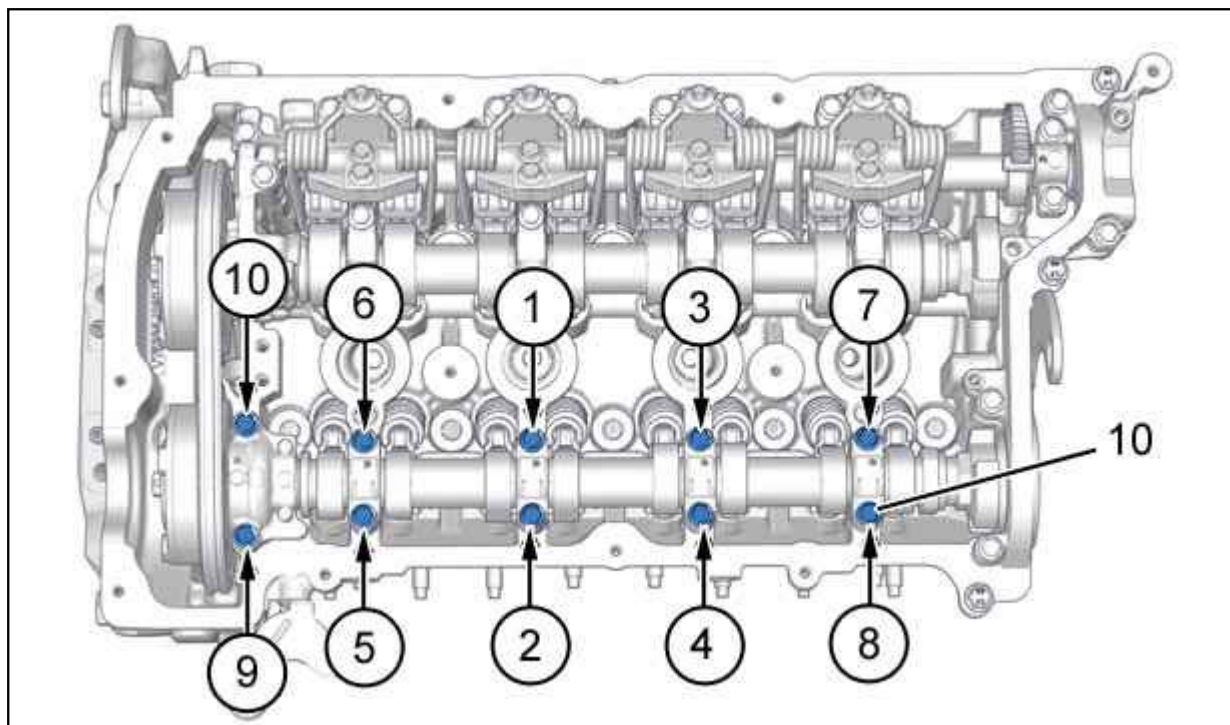


Figure : B1DG07YD

CAUTION : Respect the tightening sequence indicated.

Slacken the controls "a" on the tool [0197-3A].

Remove :

- The bolts (11)
- The tool [0197-3A]

CAUTION : Replace the bolt (1) of the pulley (2) of the exhaust camshaft (12).

CAUTION : Degrease the contact surfaces of the pulley (2) on the exhaust camshaft (12) prior to tightening the bolt (1).

Fit :

- The timing chain anti-knock pad (7)
- The bolts (6)
- The camshaft setting tool [0197]
- The bolts (3)
- The pick-up unit (5)
- The (4) bolt
- The pulley (2) of the exhaust camshaft (12)
- The (1) bolt (new)
- The vacuum pump

Adjust the timing.

CAUTION : Perform the operations to be carried out following reconnection of the battery.

Connect the battery.

4. Induction camshaft

4.1. Removing : Preliminary

Place the vehicle on a two-post ramp.

Disconnect the battery.

Adjust the timing.

Remove the exhauster .

CAUTION : The chain tensioner has to be removed.

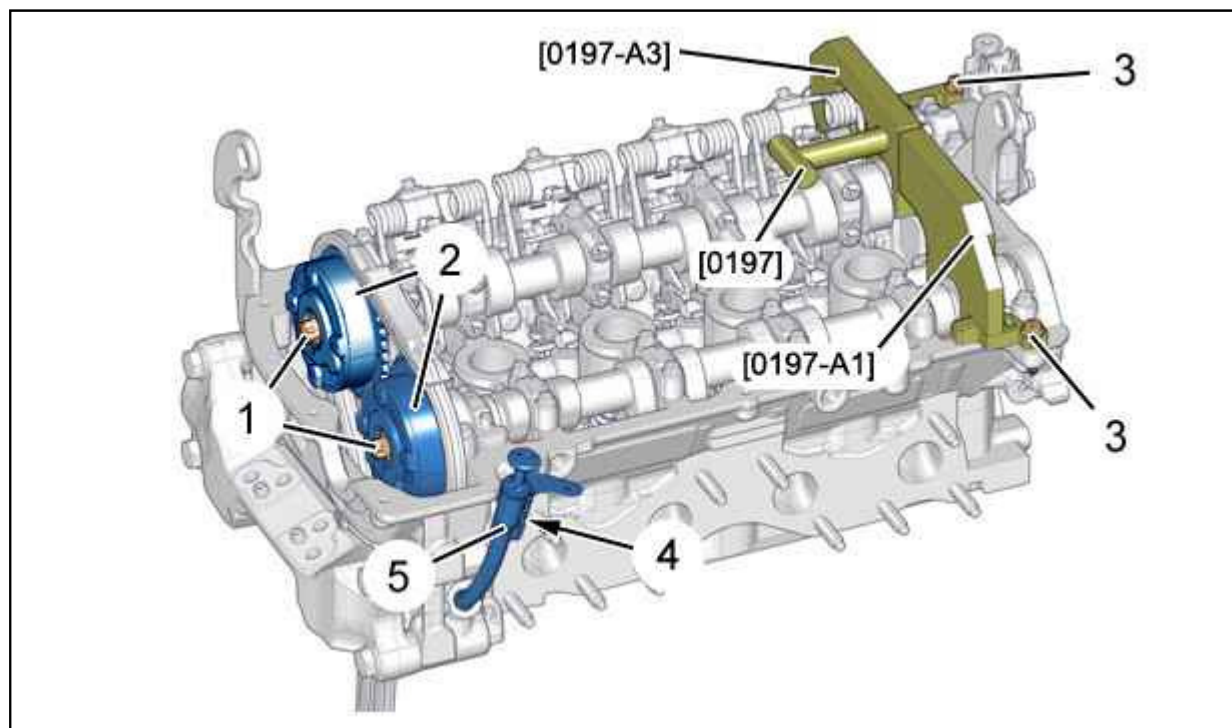


Figure : B1DG082D

Remove the bolts (1).

Release : The camshaft pulleys (2).

Remove :

- The (4) bolt
- The pick-up unit (5)
- The bolts (3)
- The camshaft setting tool [0197]

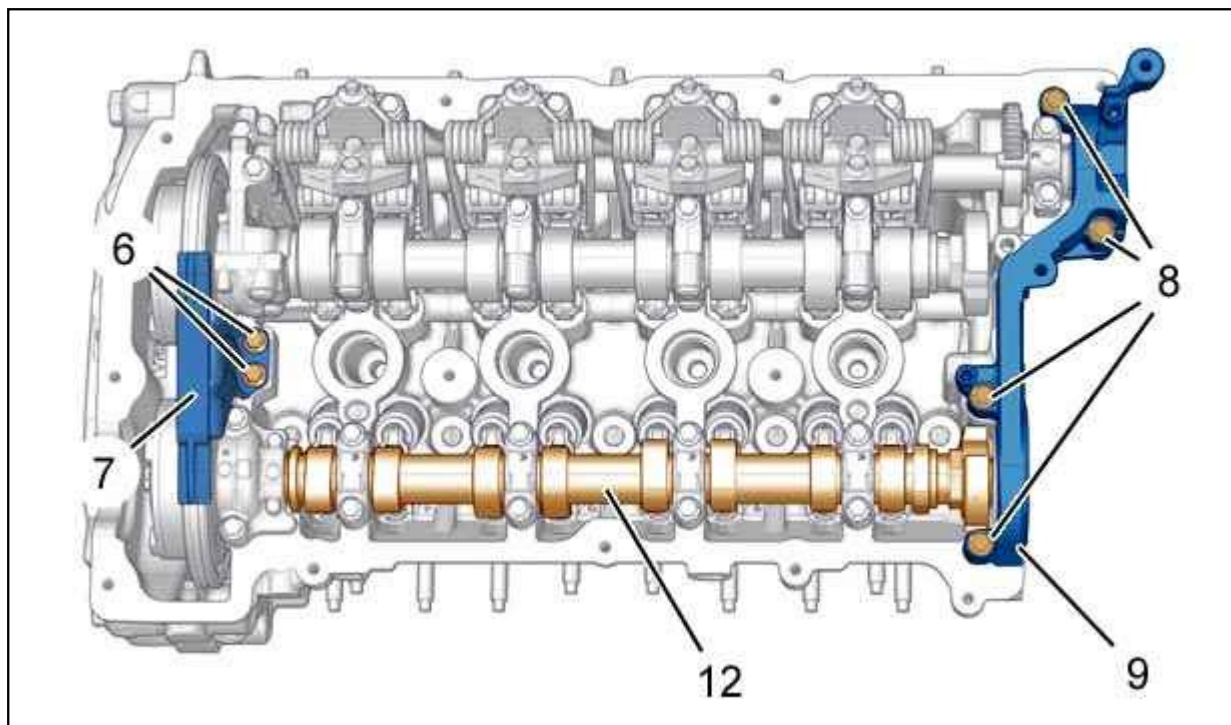


Figure : B1DG0F2D

CAUTION : Do not remove the screws (8) from the camshafts double bearing (9).

Remove :

- The bolts (6)
- The timing chain anti-knock pad (7)
- The exhaust camshaft (12)

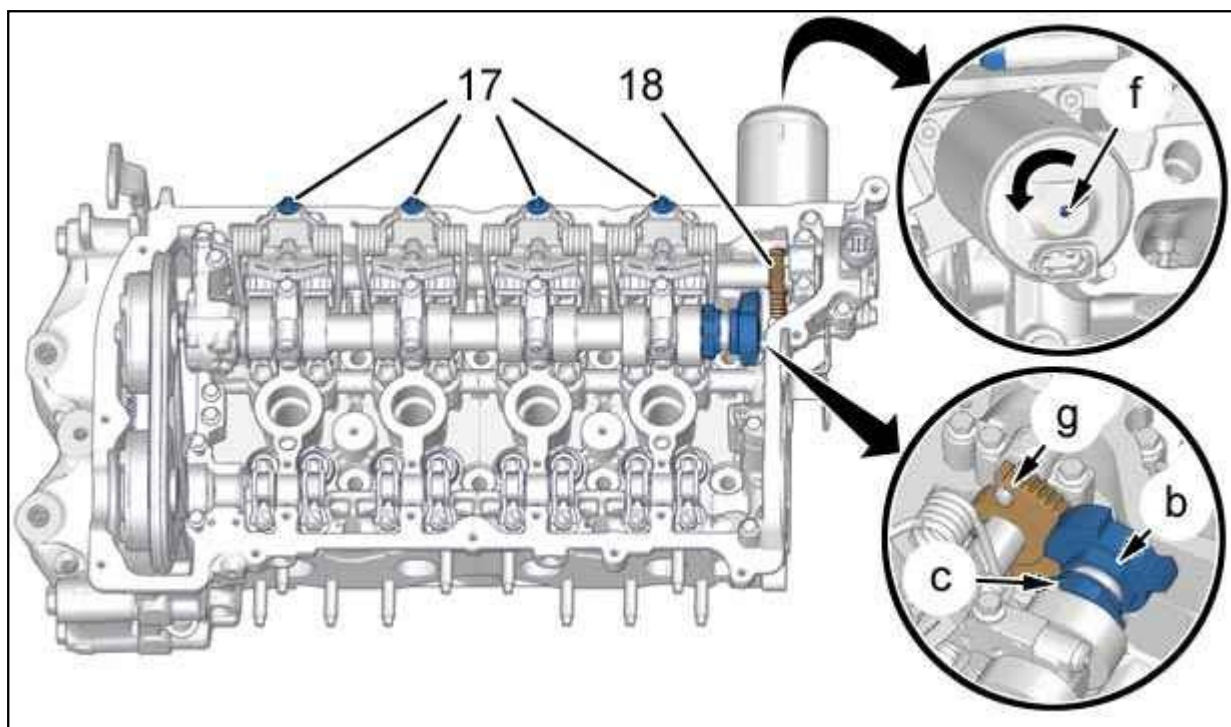


Figure : B1DG0F5D

URGENT : Do not remove the screws (17) from the variable lift springs without using the tool [0197-3B1].

CAUTION : Position the eccentric shaft prior to removal : The toothed wheel (18) should be against its stop "g"; if it is not, turn the bolt "f" anti-clockwise until it is ; Using a 4mm 6-sided spanner.

CAUTION : Rotate the inlet camshaft anti-clockwise by around 30° (as "b"). The upper surface of the cam "c" should be inclined by around 30°.

N.B. : These positions allow you to place the tool [0197-3B1].

4.2. Removing : Variable lift springs

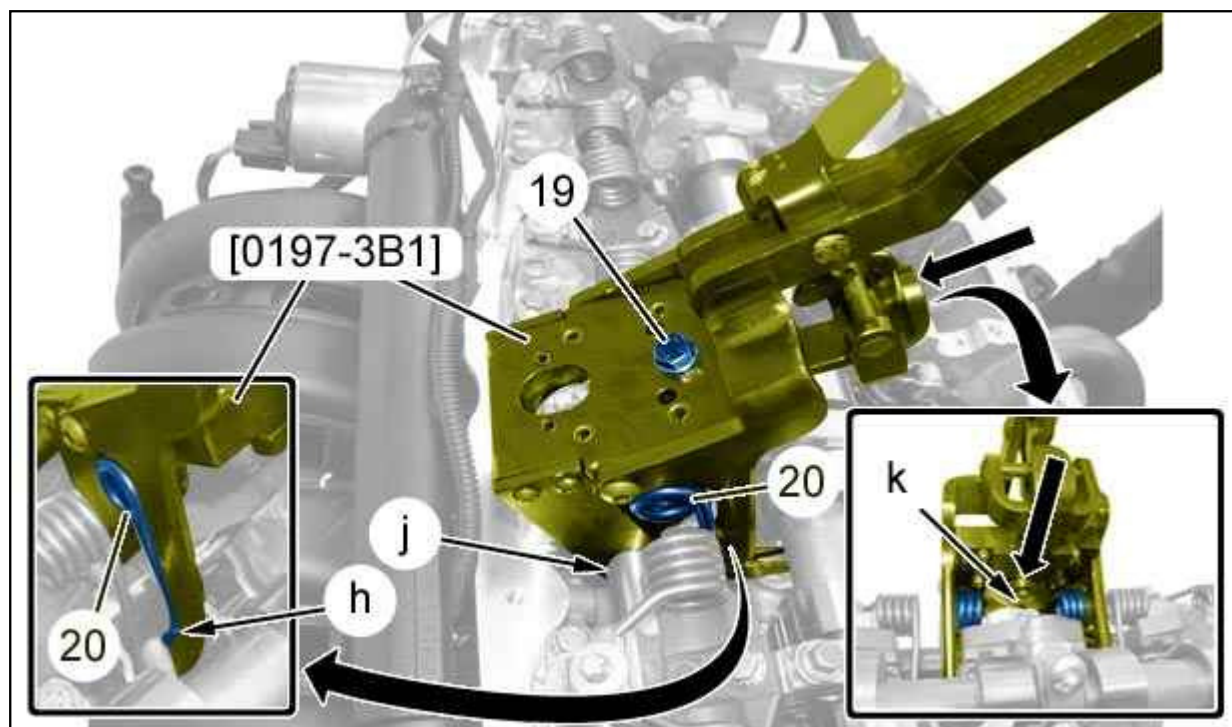


Figure : B1DG0F8D

Fit the tool [0197-3B1] :

- Press the tool [0197-3B1] onto the eccentric shaft (as "j")
- Position the jaws of the tool [0197-3B1] on the spring (20) (as "h")
- Push the locking lug against the bearing (as "k")
- Tighten the screw (19) to retain the spring (20)

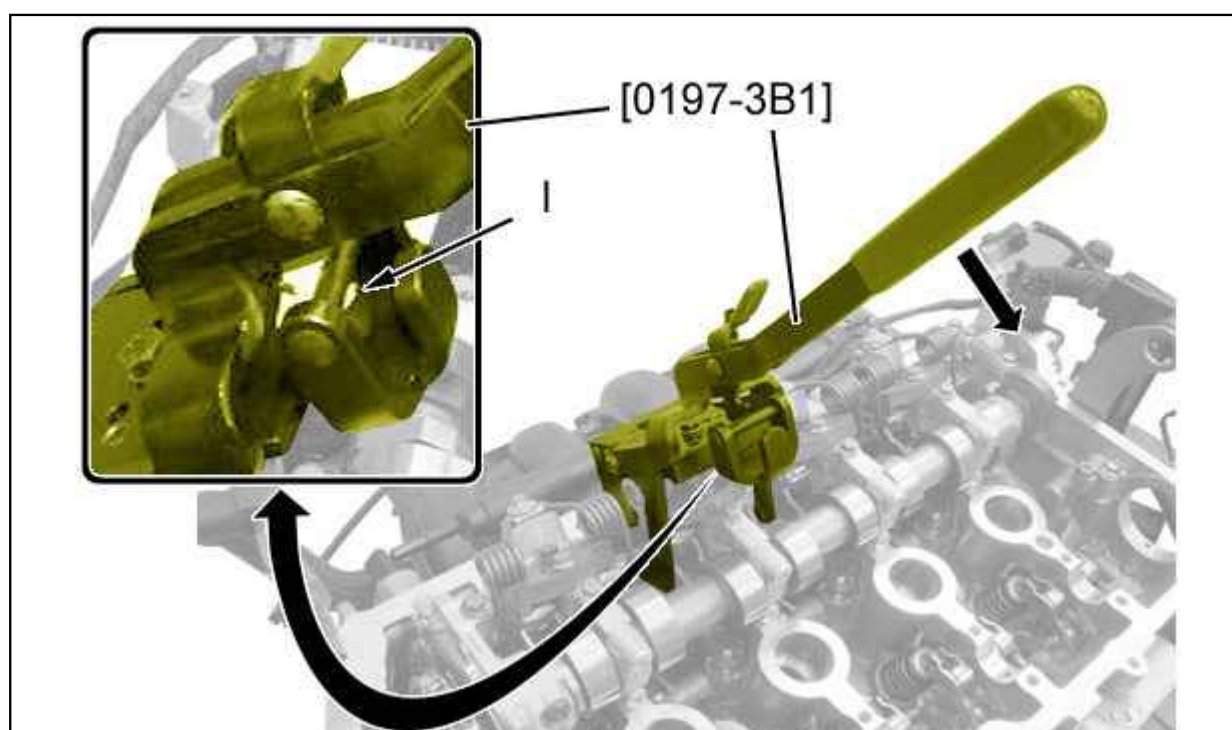


Figure : B1DG0F9D

Action the lever until the tool [0197-3B1] is locked (as "l").

CAUTION : The lock should be engaged (as "l") ; If the lock is not engaged at "l", slacken the screw (19) and push the locking lug onto the bearing (as "k").

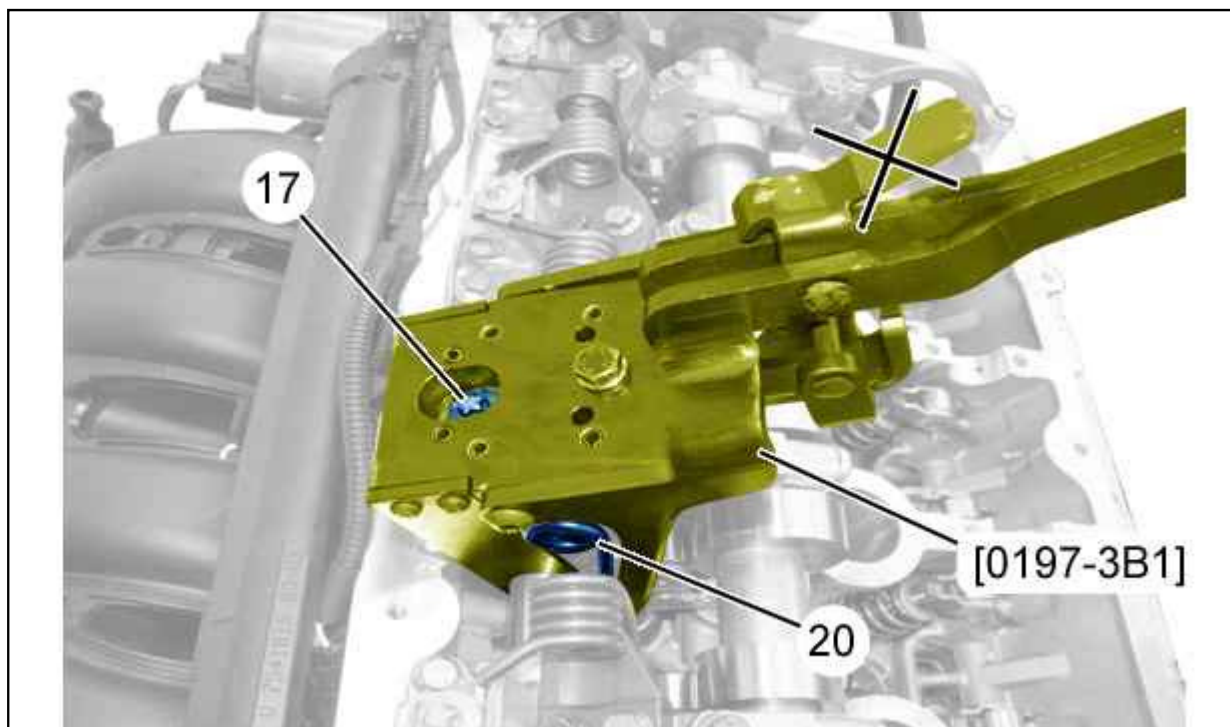


Figure : B1DG0FAD

URGENT : Do not interfere with the lock on the tool [0197-3B1] during operations, for risk of injury ; Hold the tool [0197-3B1] by its shaft.

Remove bolts (17).

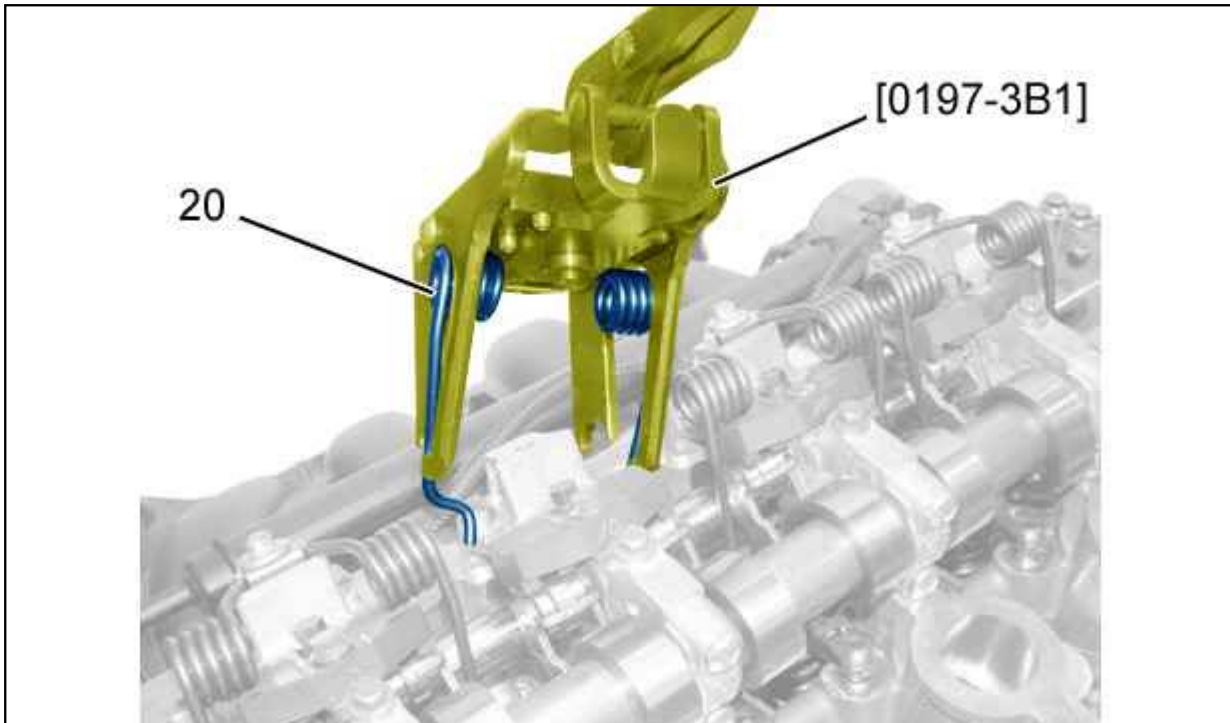


Figure : B1DG0FBD

Remove the tool [0197-3B1] together with the spring (20).

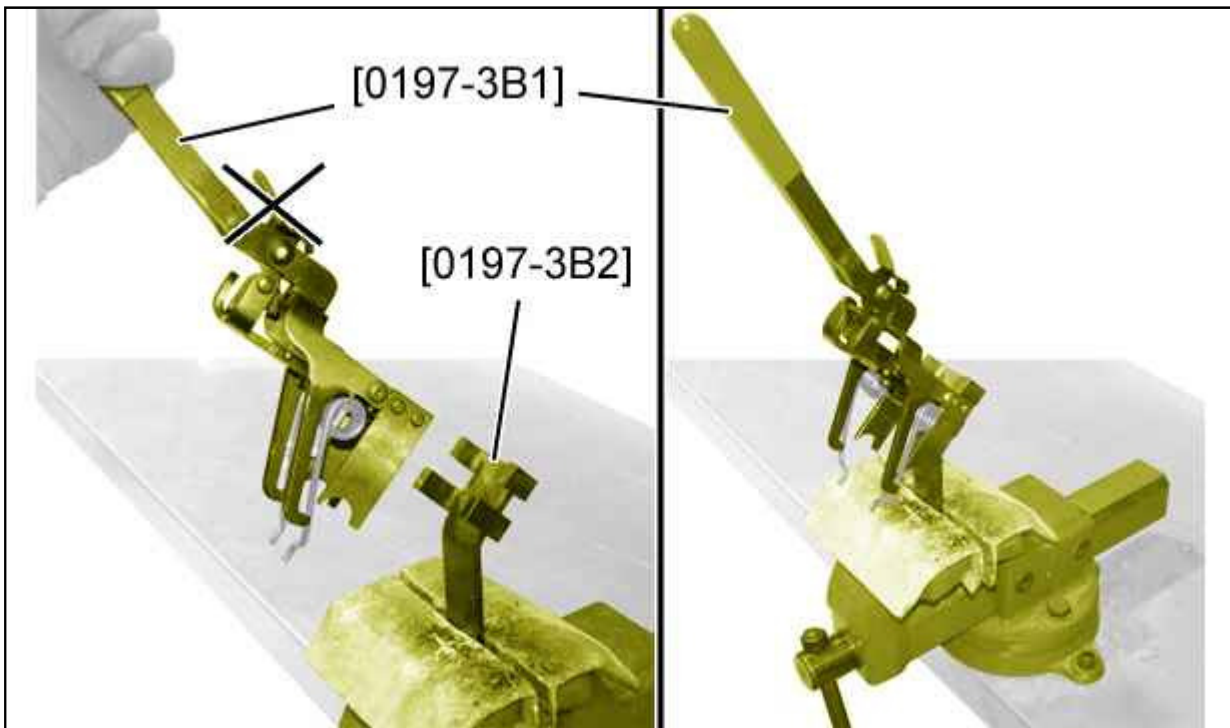


Figure : B1DG0FCD

URGENT : Do not interfere with the lock on the tool [0197-3B1] during operations, for risk of injury ; Hold the tool

[0197-3B1] by its shaft.

Placing the tools [0197-3B1], [0197-3B2] in the vice.

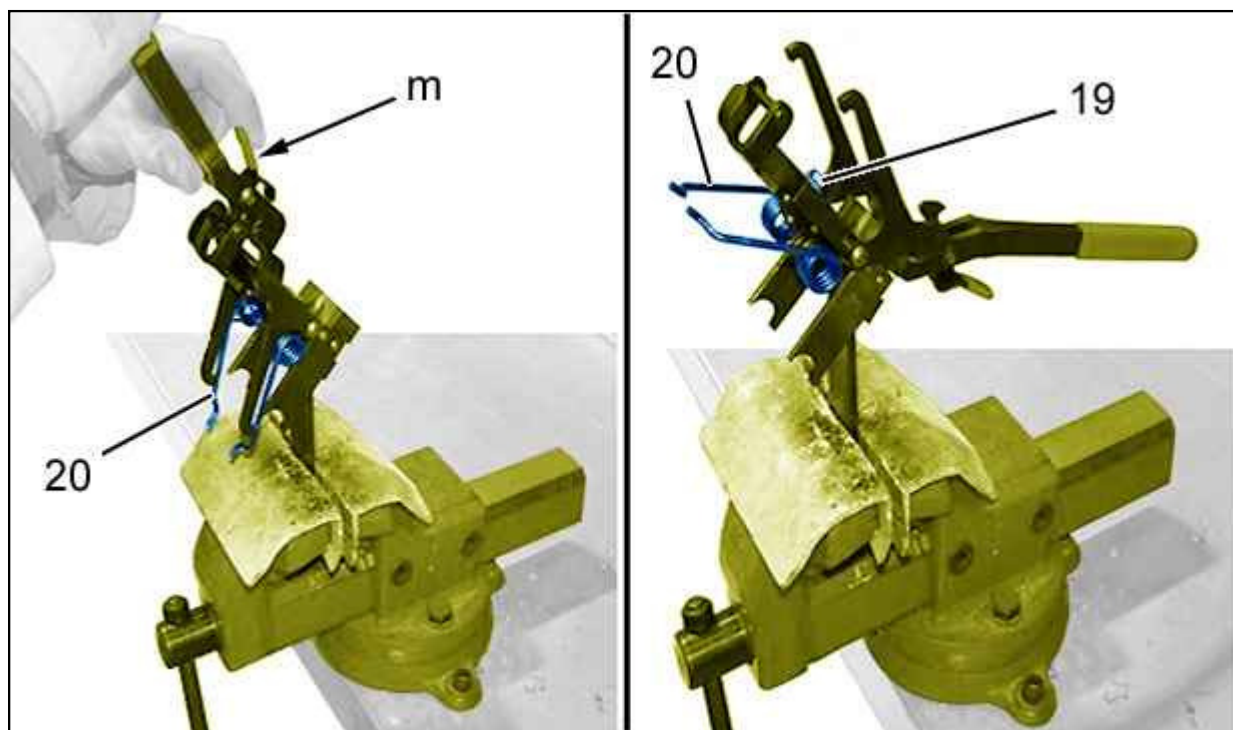


Figure : B1DG0FDD

Unlock the tools [0197-3B1] (as "m") ; Detension the spring (20) slowly.

Remove :

- The (19) bolt
- The spring (20)

Repeat the operation on the other springs (20).

4.3. Removing : Induction camshaft

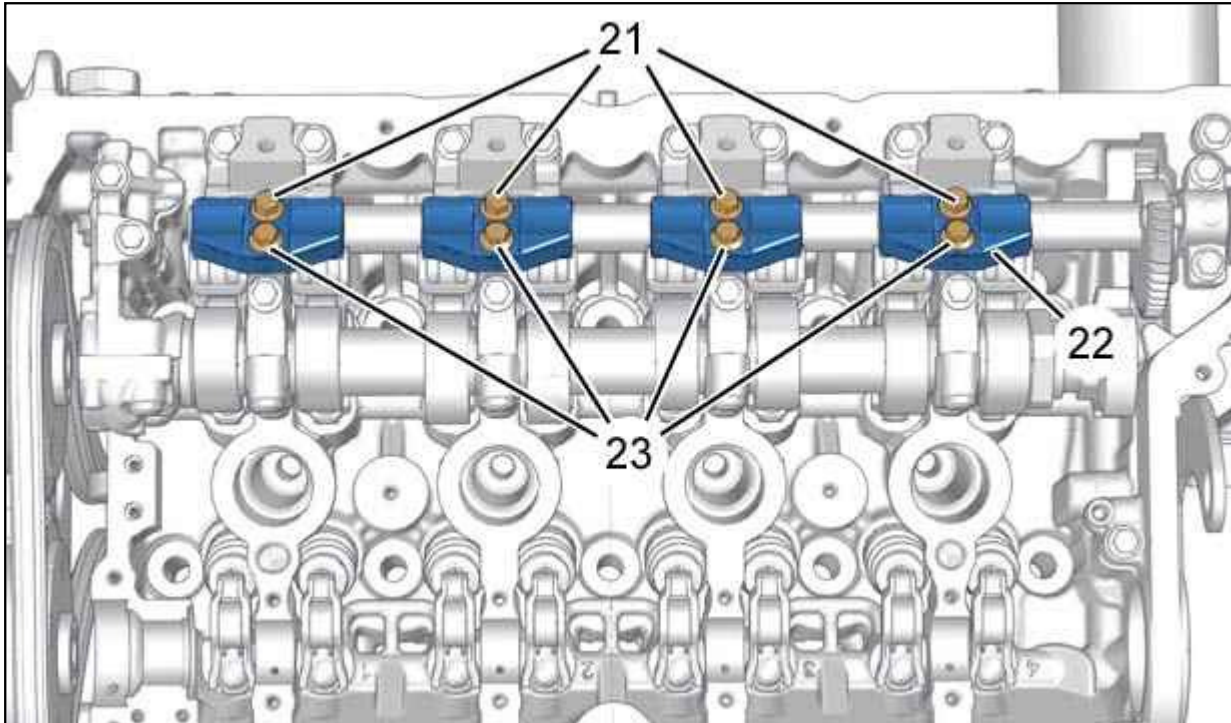


Figure : B1DG0FED

Remove :

- The bolts (21)
- The bolts (23)
- The guides (22)

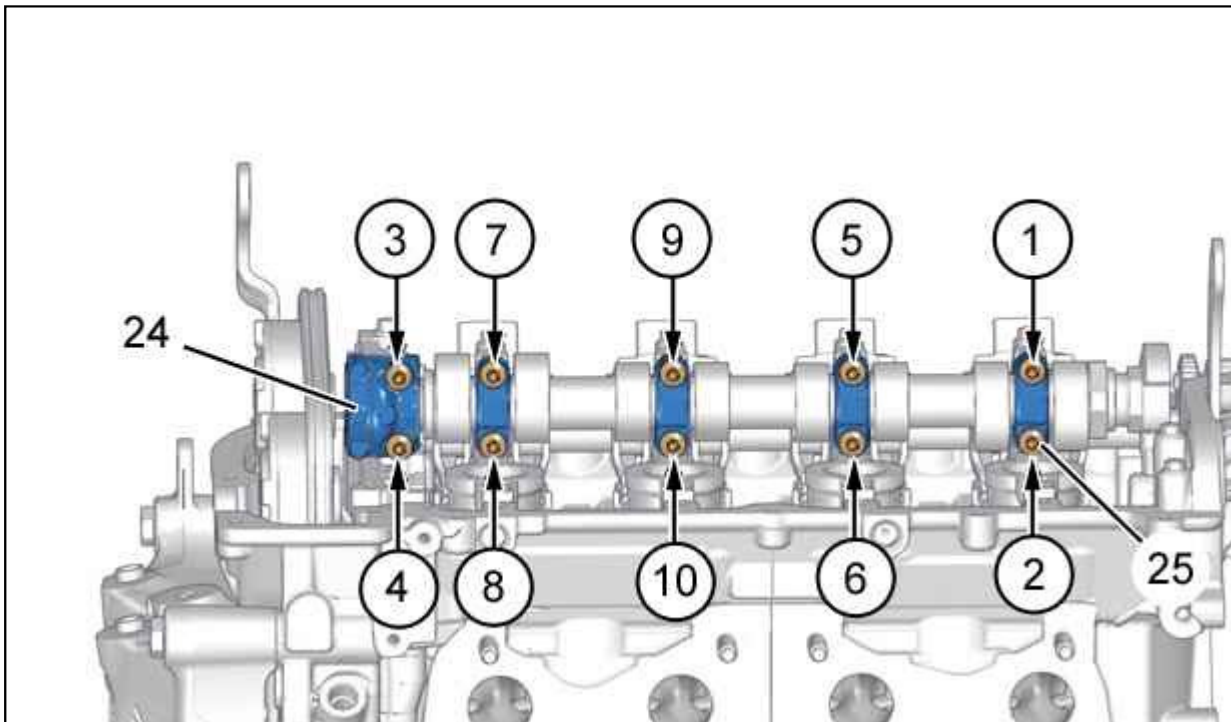


Figure : B1DG0FFD

Remove :

- The bolts (25)
- The camshaft bearing caps (24)
- The inlet camshaft

4.4. Removing : Eccentric shaft

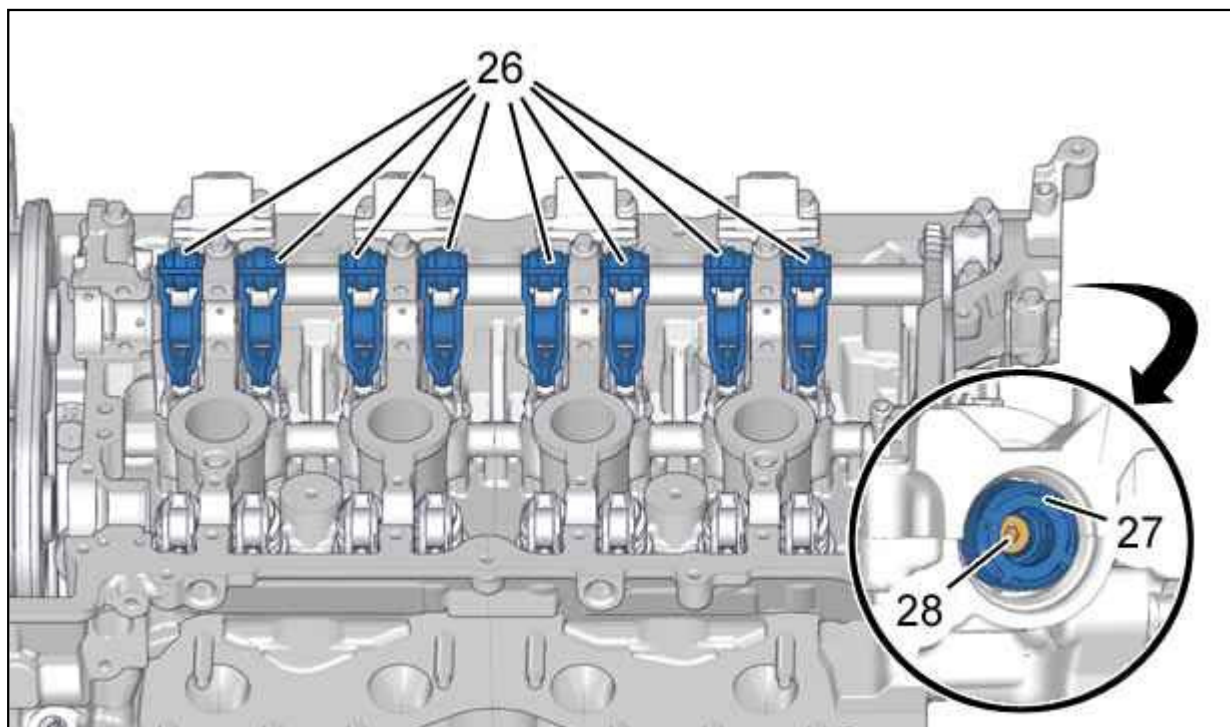


Figure : B1DG0FGD

CAUTION : Mark the positions of the variable lift valve rockers (26).

Remove :

- The variable lift valve rockers (26)
- The variable lift motor
- The camshaft position sensor
- The (28) bolt
- The eccentric shaft target (27)

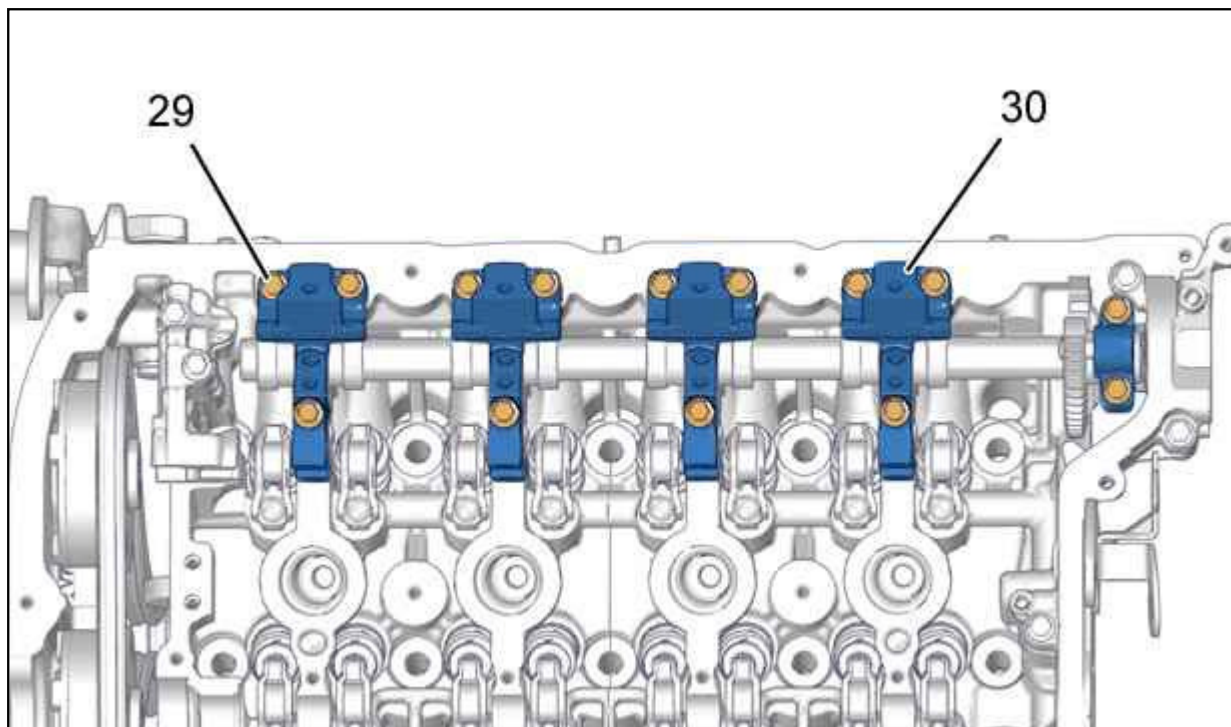


Figure : B1DG0FHD

Remove :

- The bolts (29)
- The eccentric shaft bearings /Inlet camshaft (30)

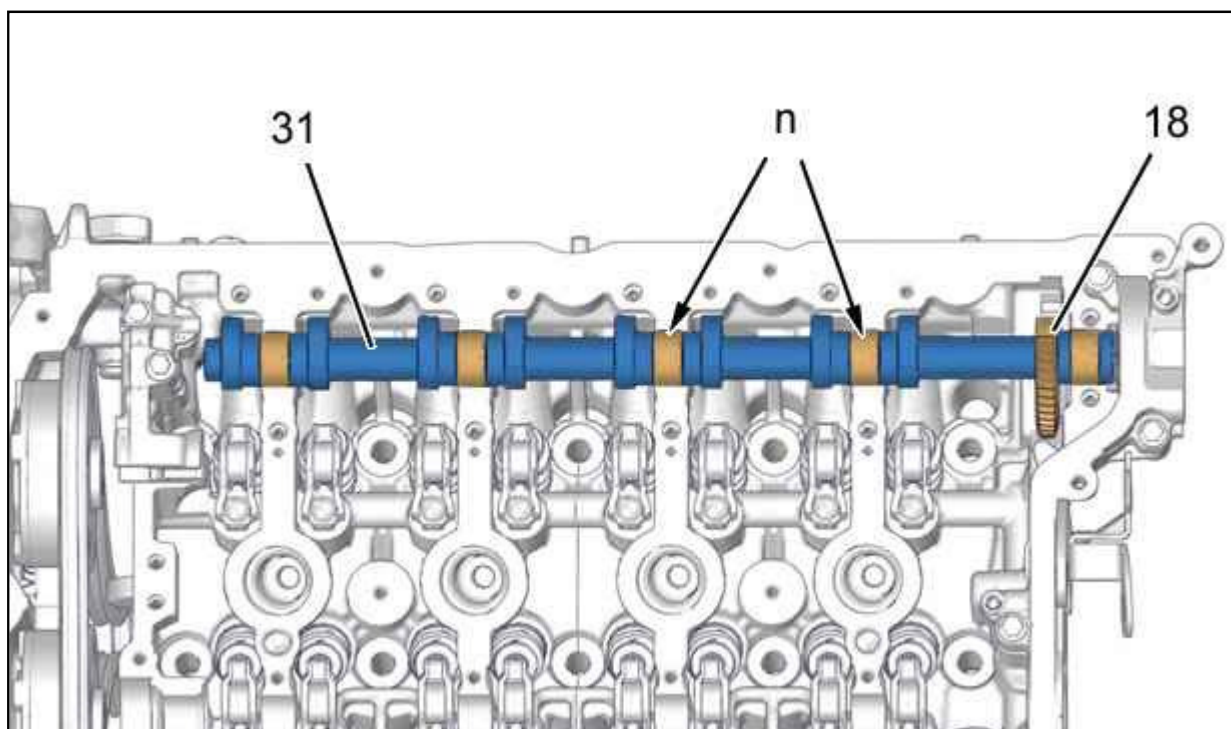


Figure : B1DG0FID

Remove : The eccentric shaft (31).

Check the condition of the needle bearings (as "n") : The eccentric shaft (31) should rotate freely. If there is a tight spot, replace the eccentric shaft (31).

N.B. : Oil (Before refitting) : The toothed wheel (18).

4.5. Refitting : Eccentric shaft

CAUTION : Adhere to the tightening torques  .

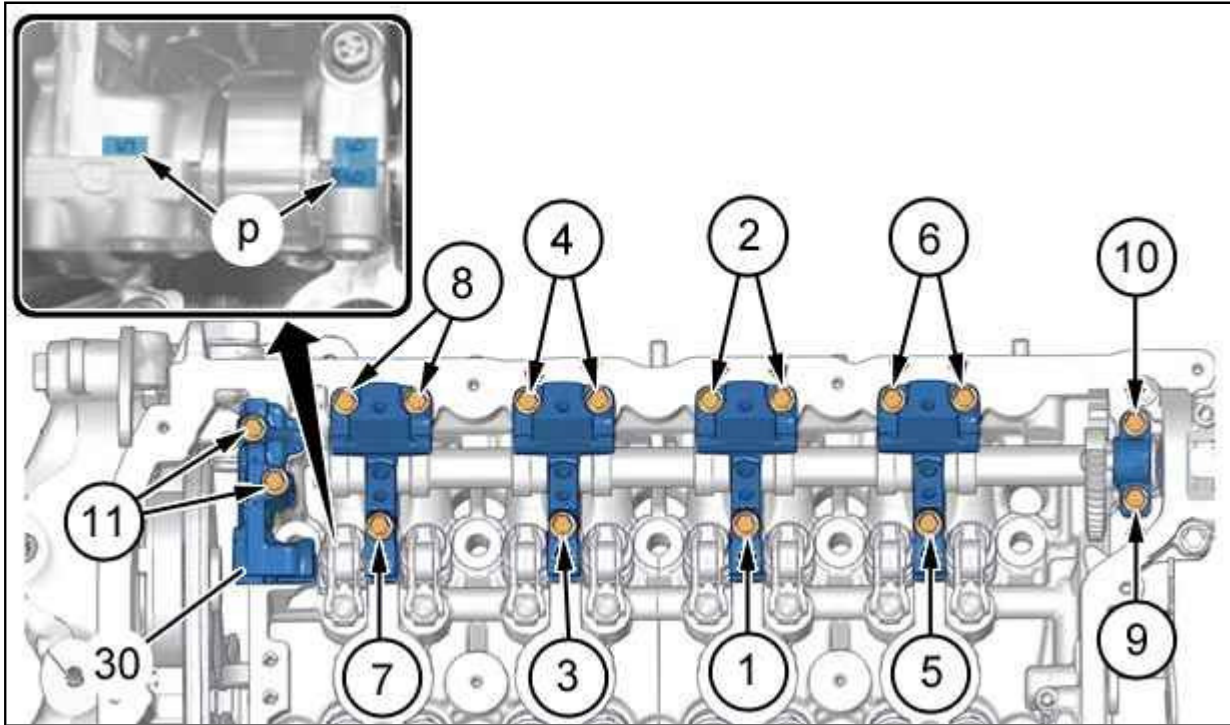


Figure : B1DG0FJD

CAUTION : Follow the tightening sequence.

Oil : The eccentric shaft bearings /Inlet camshaft (30).

CAUTION : Take note of the markings on the eccentric shaft bearings/Induction camshaft (30) (as "p") ; From 5 to 9.

Fit :

- The eccentric shaft (31)
- The eccentric shaft bearings /Inlet camshaft (30)
- The bolts (29) ; Tighten to the specified torque

If the rockers and hydraulic tappets are to be removed : Mark (Before removal) :

- The location of the rockers
- The location of the hydraulic tappets

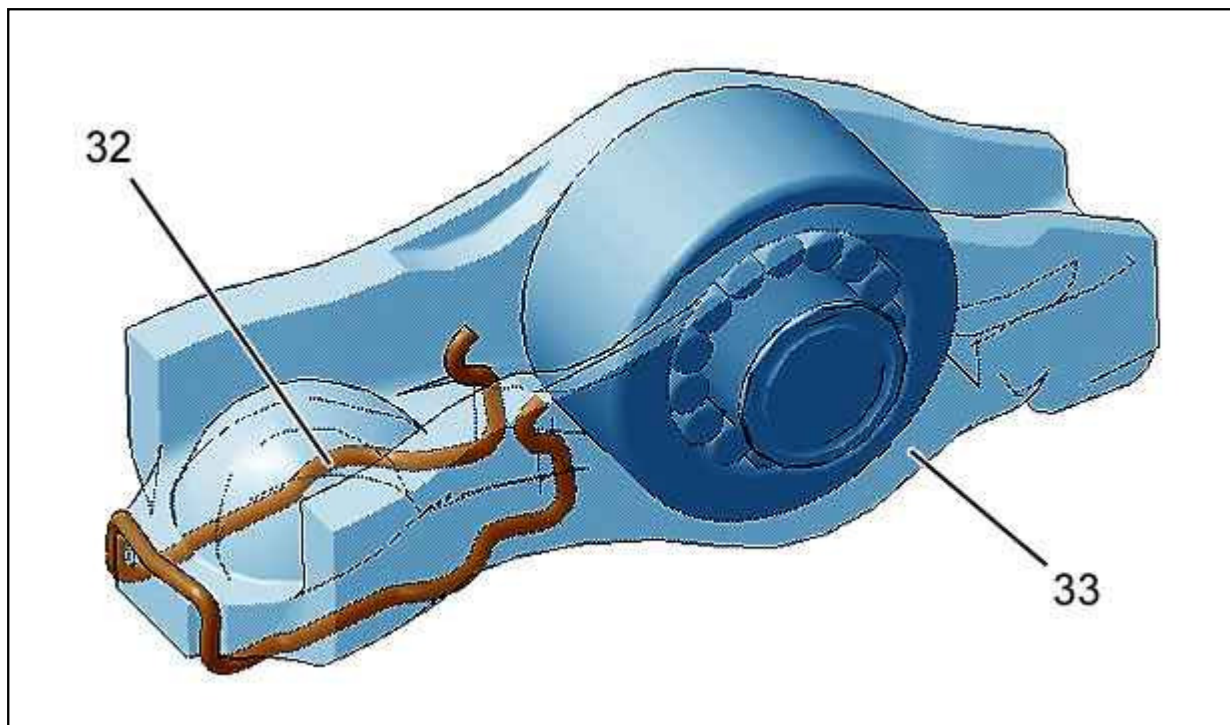


Figure : B1DG0FKD

Check the presence of the clips (32) on the roller rockers (33).

CAUTION : The clip (32) must not be distorted in any circumstances ; A clip that is distorted, even very slightly, risks not being able to hold the roller rocker (33) on the hydraulic tappet.

Oil the body of the hydraulic tappets (With clean engine oil).

Fit : The hydraulic followers (Observe their original location).

Check that the hydraulic tappets rotate freely in the cylinder head.

CAUTION : Observe their original location.

Refit the roller valve rockers (33) fitted with their clip (32).

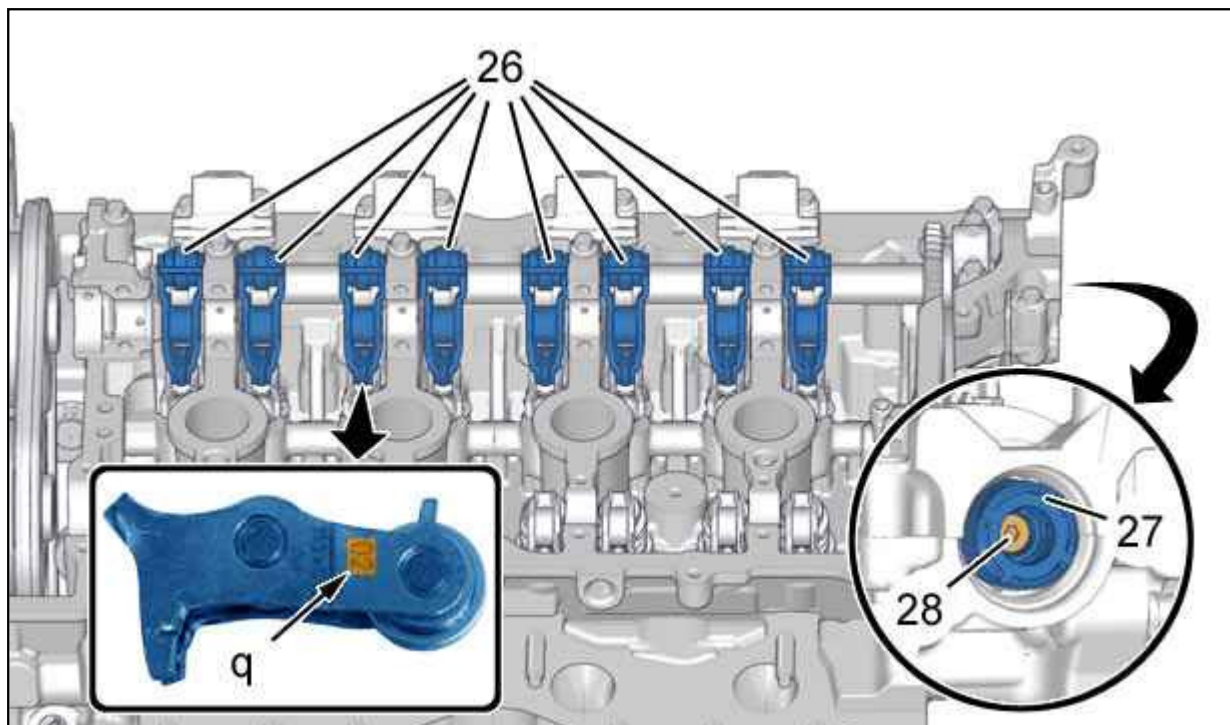


Figure : B1DG0FLD

CAUTION : The variable lift valve rockers (26) must be refitted in identical fashion.

CAUTION : Pay attention to the markings on the variable lift valve rockers (26) (as "q").

Oil : The variable lift valve rockers (26).

Fit :

- The variable lift valve rockers (26)
- The eccentric shaft target (27)
- The (28) bolt ; Tighten to the specified torque
- The camshaft position sensor
- The variable lift motor

4.6. Refitting : Induction camshaft

CAUTION : Adhere to the tightening torques .

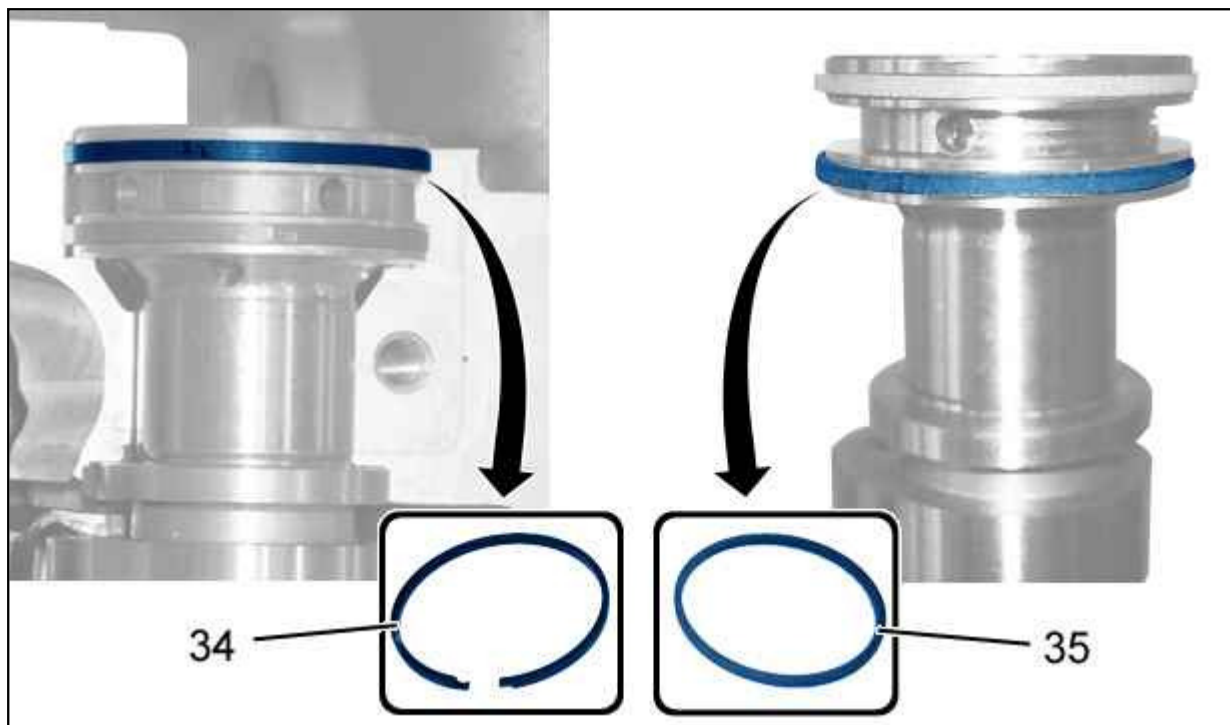


Figure : B1DG0FMD

CAUTION : Always replace : The camshaft seals .

Replace the old type metal ring seals (34) with the new ring seals PTFE (35).
Do not scratch either the grooves or the shoulders when removing the metal ring seals.
Do not oil the ring seals PTFE (35) prior to fitting.

CAUTION : Check that the seal has not turned over in its groove, rotate the seals a few times in their grooves to make sure they are correctly in place and there are no tight spots.

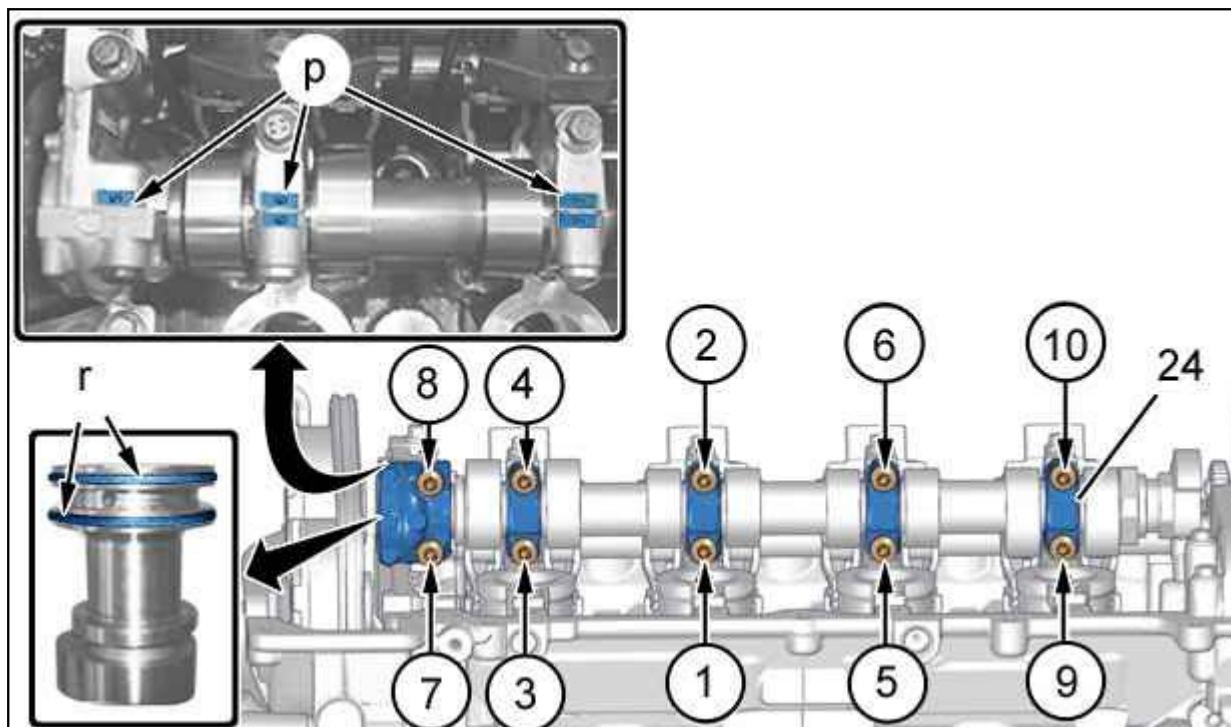


Figure : B1DG0FND

CAUTION : Take note of the markings on the camshaft bearings (as "p") ; From 5 to 9.

Oil : The camshaft bearing caps (24).

CAUTION : Orient the oblong slot bearings (as "r") Upwards.

Fit :

- The inlet camshaft
- The camshaft bearing caps (24)
- The bolts (25) ; Tighten to the specified torque

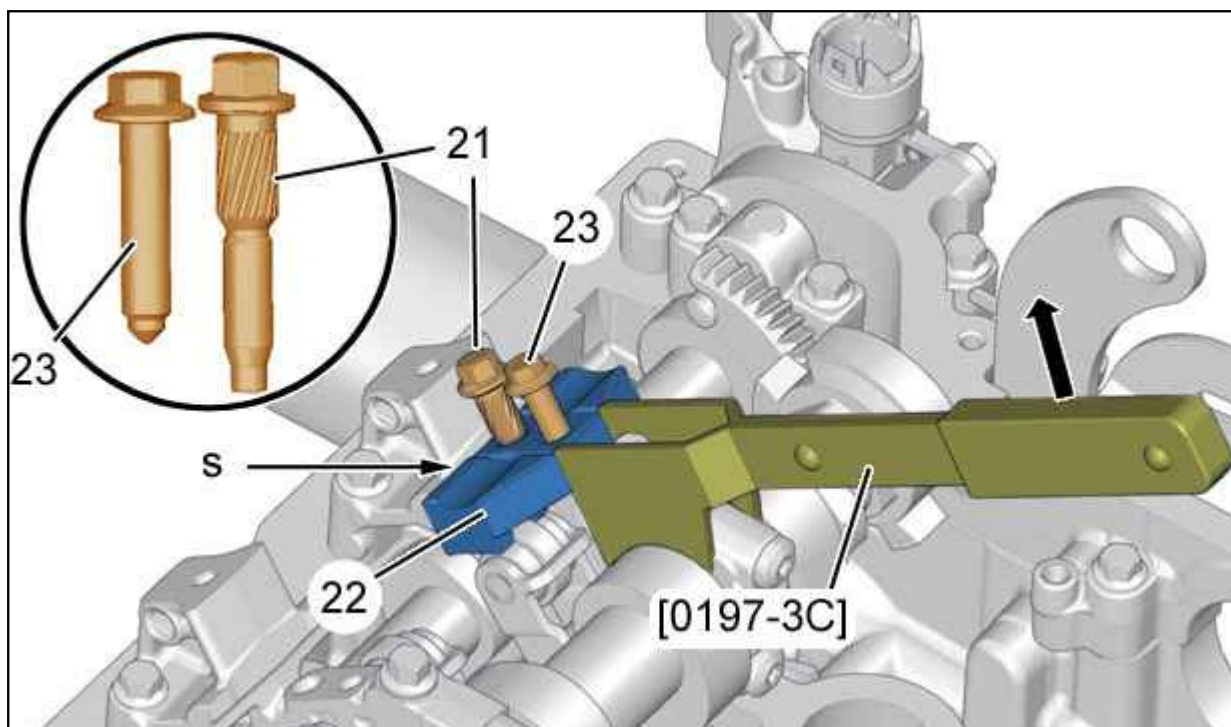


Figure : B1DG0FOD

CAUTION : Refit the guides (22) in their original positions ; Using tool [0197-3C].

Oil : The guides (22).

CAUTION : Observe the order of tightening of the bolts (21), (23) (*).

Fit :

- The guide (22)
- The (21) bolt (*) ; Pre-tighten to the specified torque
- The (23) bolt (*) ; Pre-tighten to the specified torque

Slacken the 2 bolts (21), (23) by 90°.

Fit the tool [0197-3C] : Action the lever upwards.

Retain the guide (22) on its bracket (as "s").

Tighten to the specified torque :

- The (21) bolt (*)
- The (23) bolt (*)

Remove the tool [0197-3C].

Repeat the operation on the other guides (22).

4.7. Refitting : Variable lift springs

CAUTION : Adhere to the tightening torques  .

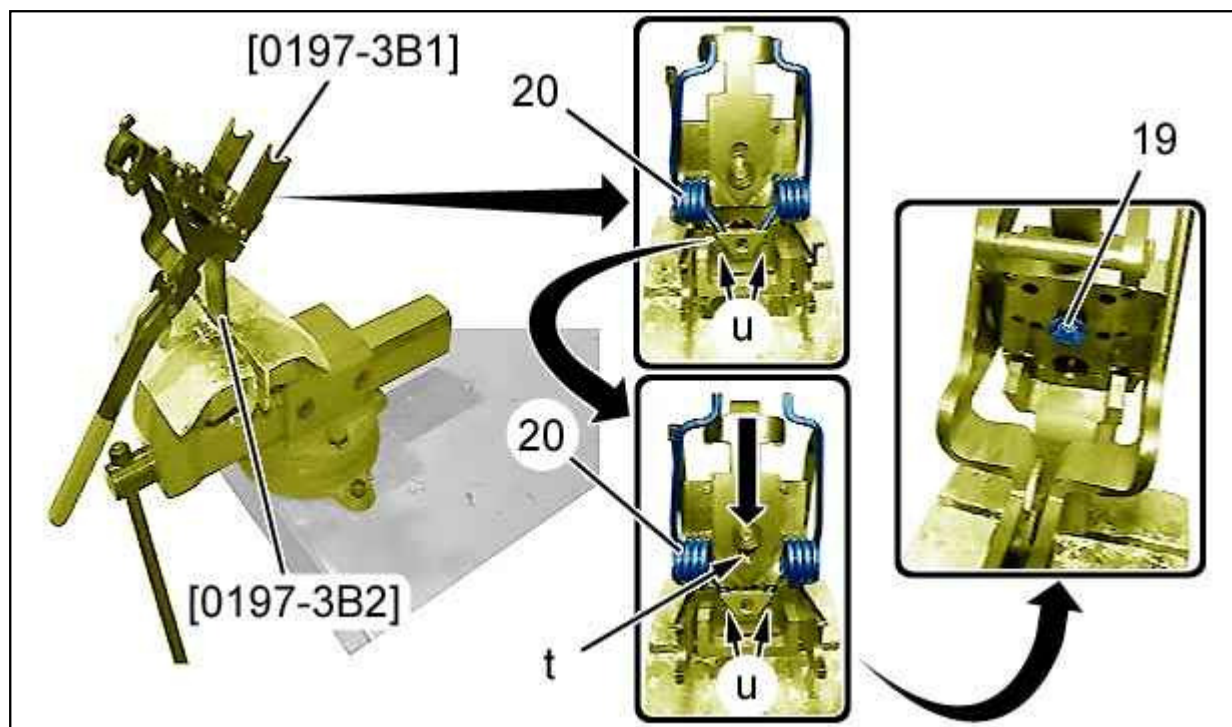


Figure : B1DG0FPD

Turn over the tool [0197-3B1] on the tool [0197-3B2].
 Fit and centre the spring (20) in its housing against the dowels (as "u").
 Push down the locking lug of the tool [0197-3B1] (as "t").
 Tighten the bolt (19) .
 Check the positioning of the spring (20) on the tool [0197-3B1].

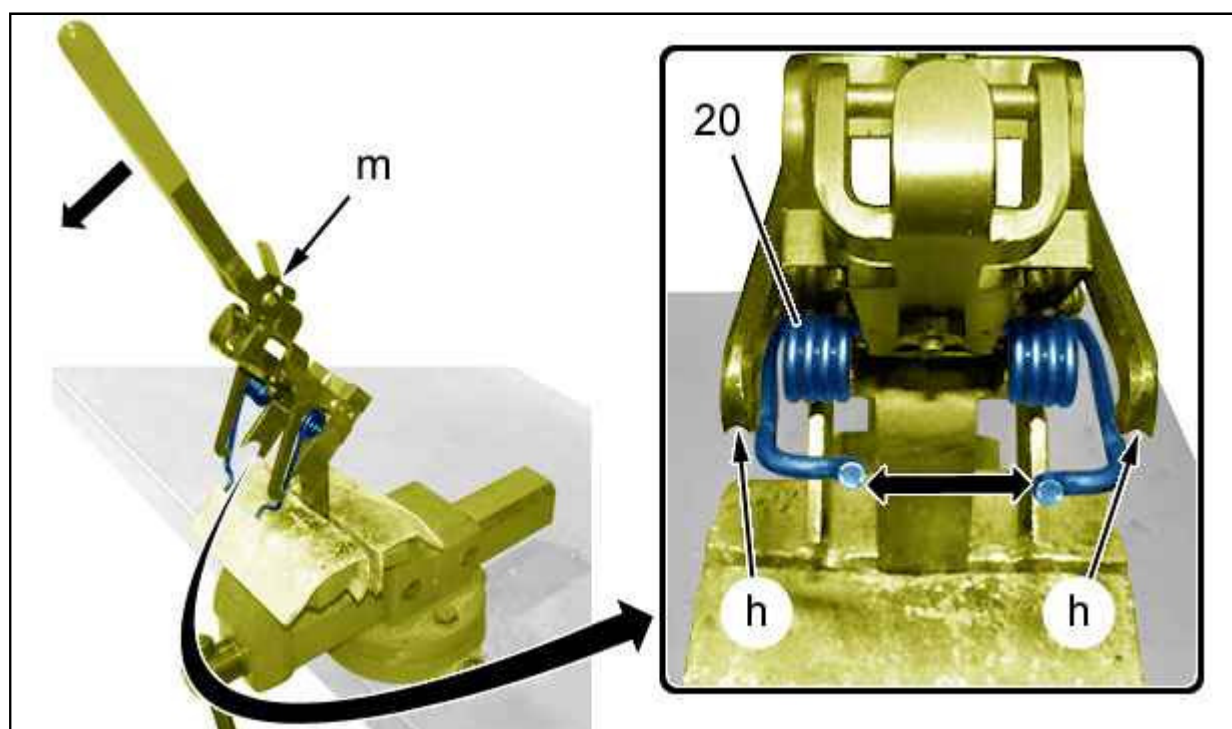


Figure : B1DG0FQD

Position the tool [0197-3B1] on the tool [0197-3B2].

Manually spread the extremities of the spring (20) and position them at "h" in the grooves in the jaws of the tool [0197-3B1].

Action the lever to compress the spring (20) and lock the tool [0197-3B1] (as "m").

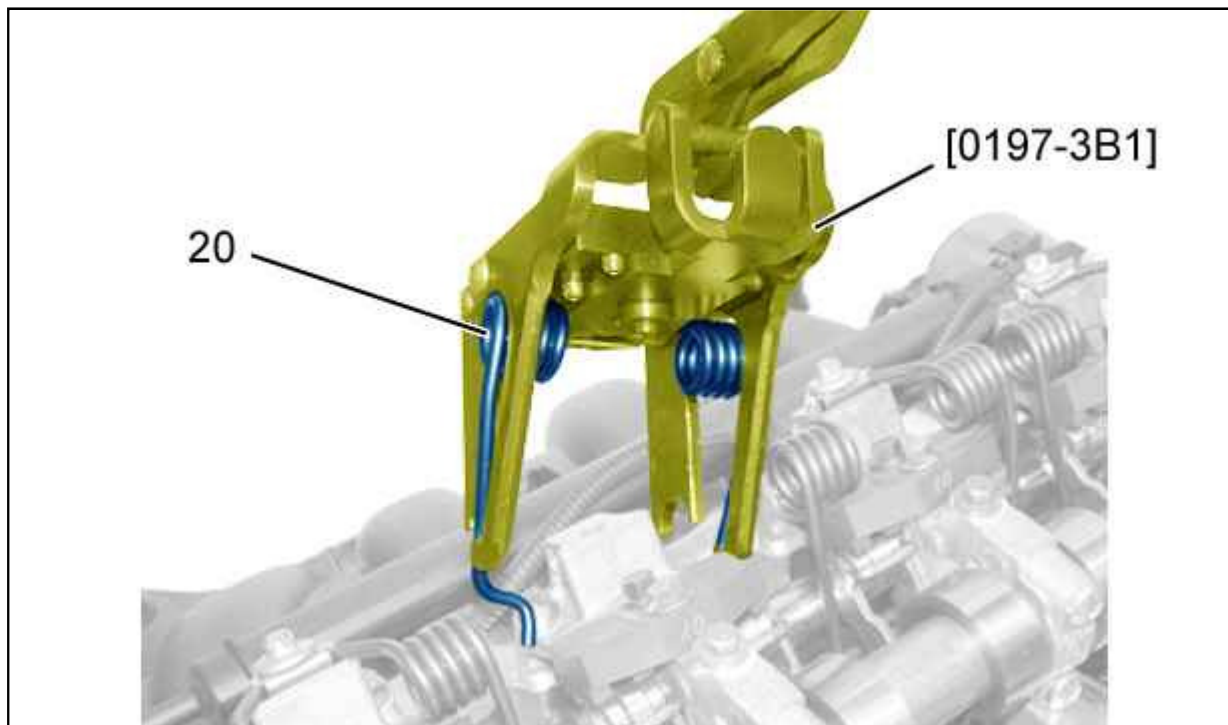


Figure : B1DG0FRD

URGENT : Do not interfere with the lock on the tool [0197-3B1] during operations, for risk of injury ; Hold the tool [0197-3B1] by its shaft.

CAUTION : Position the eccentric shaft prior to removal : The toothed quadrant should be at the stop "g", if not then turn the screw "f" anti-clockwise to reach the stop ; Using a 4mm 6-sided spanner.

CAUTION : Rotate the inlet camshaft anti-clockwise by around 30° (as "b"). The upper surface of the cam "c" should be inclined by around 30°.

N.B. : These positions allow you to place the tool [0197-3B1].

Position the tool [0197-3B1] together with the spring (20).

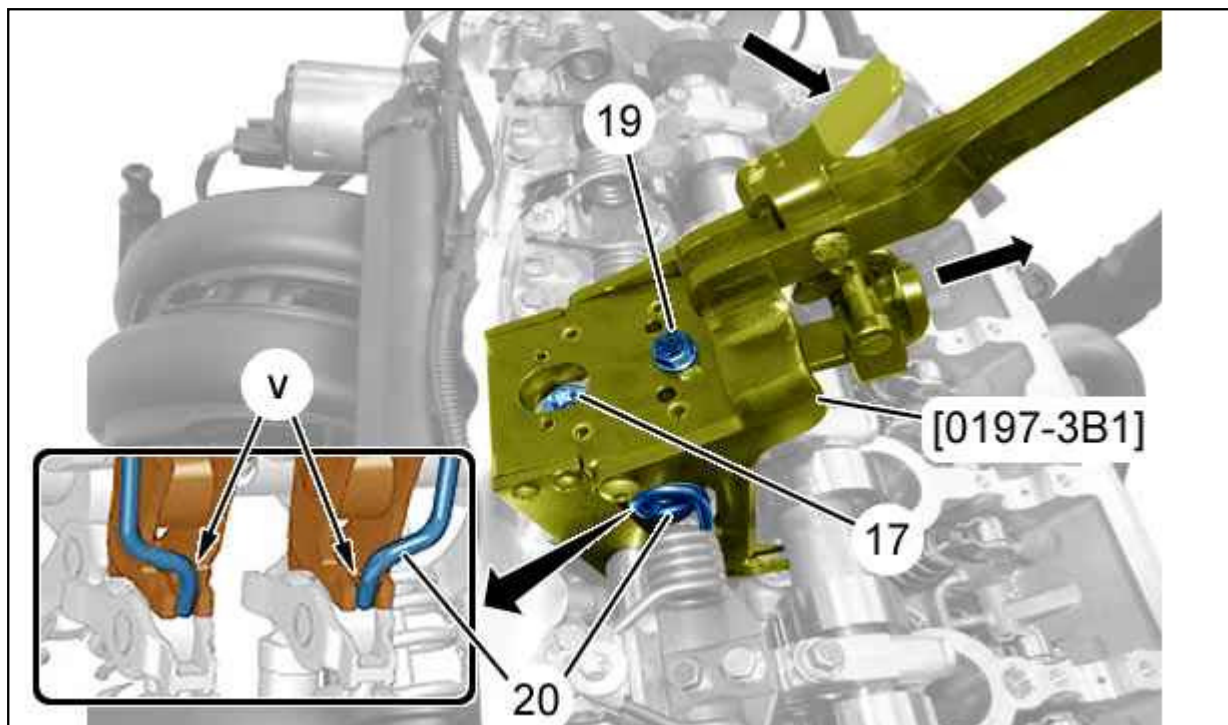


Figure : B1DG0FSD

Refit screw (17) ; Tighten to the specified torque.
Unlock the tools [0197-3B1].

CAUTION : Check the positioning of the extremities of the spring (20) in the notches of the variable lift valve rockers (26) (as "v").

Slacken the bolt (19).
Pull the locking lug on the tool [0197-3B1].
Remove the tool [0197-3B1].
Repeat the operation on the other springs (20).

CAUTION : Degrease the contact faces of the pulleys on the camshafts before tightening the bolts (1).

Fit :

- The exhaust camshaft (12)
- The timing chain anti-knock pad (7)
- The bolts (6)
- The camshaft setting tool [0197]
- The bolts (3)
- The pick-up unit (5)
- The (4) bolt
- The camshaft pulleys (2)
- The bolts (1) (new)
- The vacuum pump

Adjust the timing.

CAUTION : Perform the operations to be carried out following reconnection of the battery.

Connect the battery.