

## DISMANTLING : ENGINE TOP ( INDIRECT INJECTION)

**URGENT** : Follow the safety instructions ⓘ.

**CAUTION** : This procedure is intended for the replacement of faulty internal components of the cylinder head. If the cylinder head is damaged, replace it with a new cylinder head assembly.

**Tooling** ⓘ.

**Stripping the cylinder head** ⓘ.

**Removing the timing** ⓘ.

**Removing the cylinder head** ⓘ.

**Removing the camshafts** ⓘ.

**Removing the rockers and tappets** ⓘ.

**Removing the valves** ⓘ.

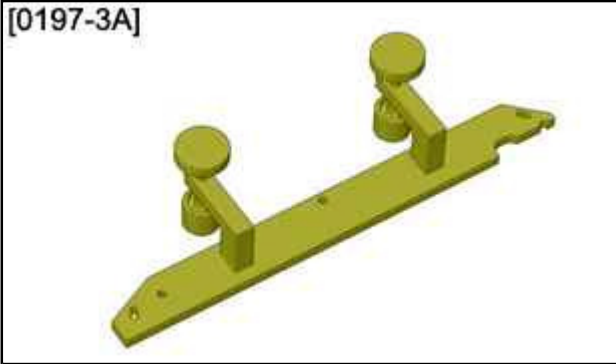
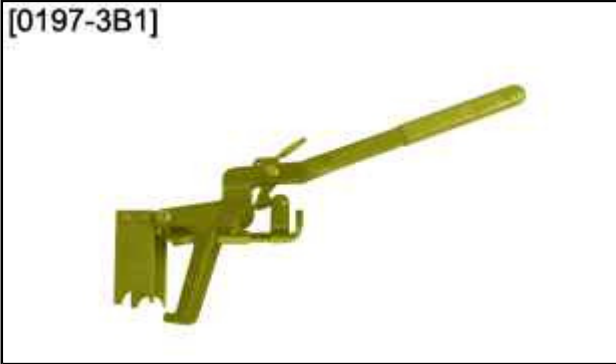
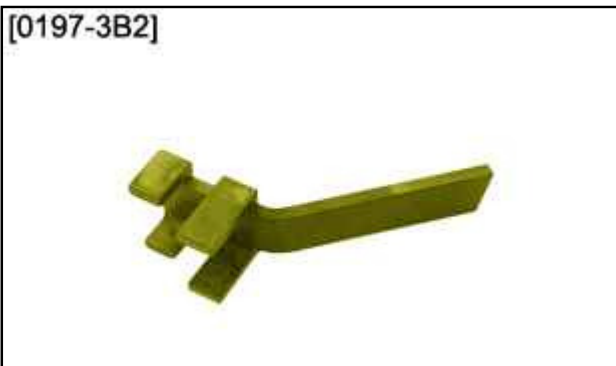
### 1. Tooling

Equipment :

- Cylinder head support (Type FACOM U.43)
- Valve spring compressor (Type FACOM U.43 LA)
- Cup thrust pad (Type FACOM SP 18380)

tool	Reference	Designation
	[0197-A3]	Inlet camshaft immobilisation and setting tool
	[0197-A1]	Exhaust camshaft immobilisation and setting tool
	[0197-B]	Crankshaft setting rod
	[0197-A4]	Fixing bolt of the tools [0197-A1], [0197-A2]
	[0197-E]	Timing chain retaining tool
	[0197-3A]	Camshaft retaining tool

Figure : E5AB0S8T

<p>[0197-3A]</p>  <p>Figure : E5AB064T</p>		
<p>[0197-3B1]</p>  <p>Figure : E5AB065T</p>	[0197-3B1]	Spring compression clamp
<p>[0197-3B2]</p>  <p>Figure : E5AB066T</p>	[0197-3B2]	Tool for holding on vice
	[.0170-A]	pliers for removing the valve stem seals

[0170-A]

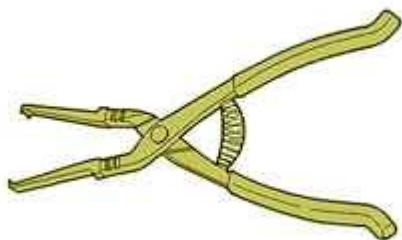


Figure : E5AB0SAT

## 2. Stripping the cylinder head

**URGENT** : The engine must be drained of all its oil before any work is carried out.

Place the engine on a stand  .

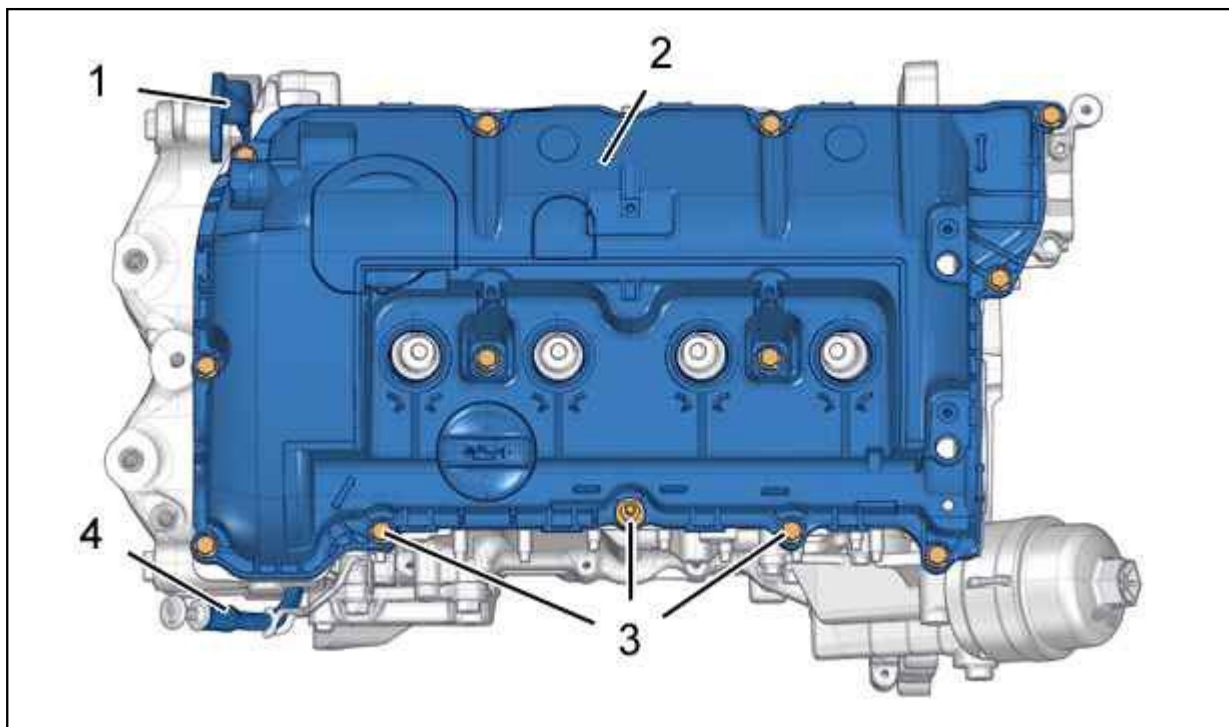


Figure : B1BG1P5D

Remove :

- The lifting eye (1)
- The bolts (3)
- The cylinder head cover (2)
- The oil gauge well (4)

### 3. Removing the timing

#### 3.1. Verification : Inlet pulley dephased

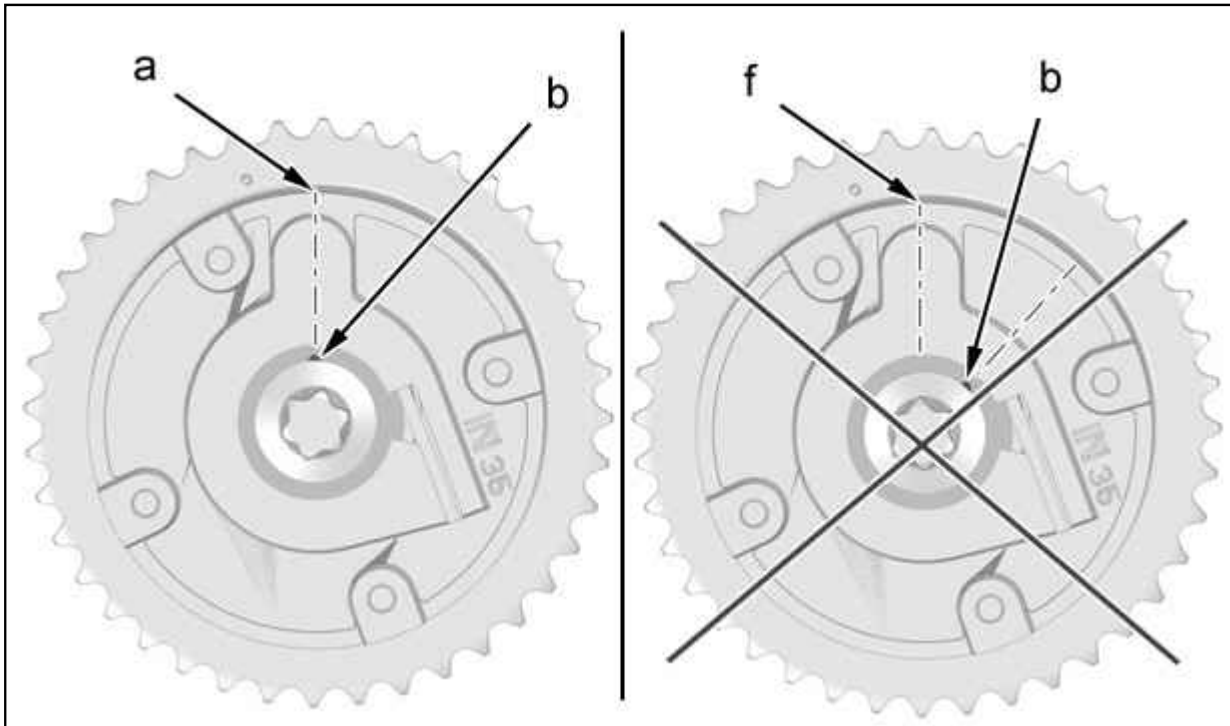


Figure : B1BG1P8D

Check that the marking "b" is aligned with the boss "a".

If the marking "b" is not aligned with the boss "a" : Go to the next stage "manual locking of dephasers".

#### 3.2. Verification : Exhaust pulley dephased

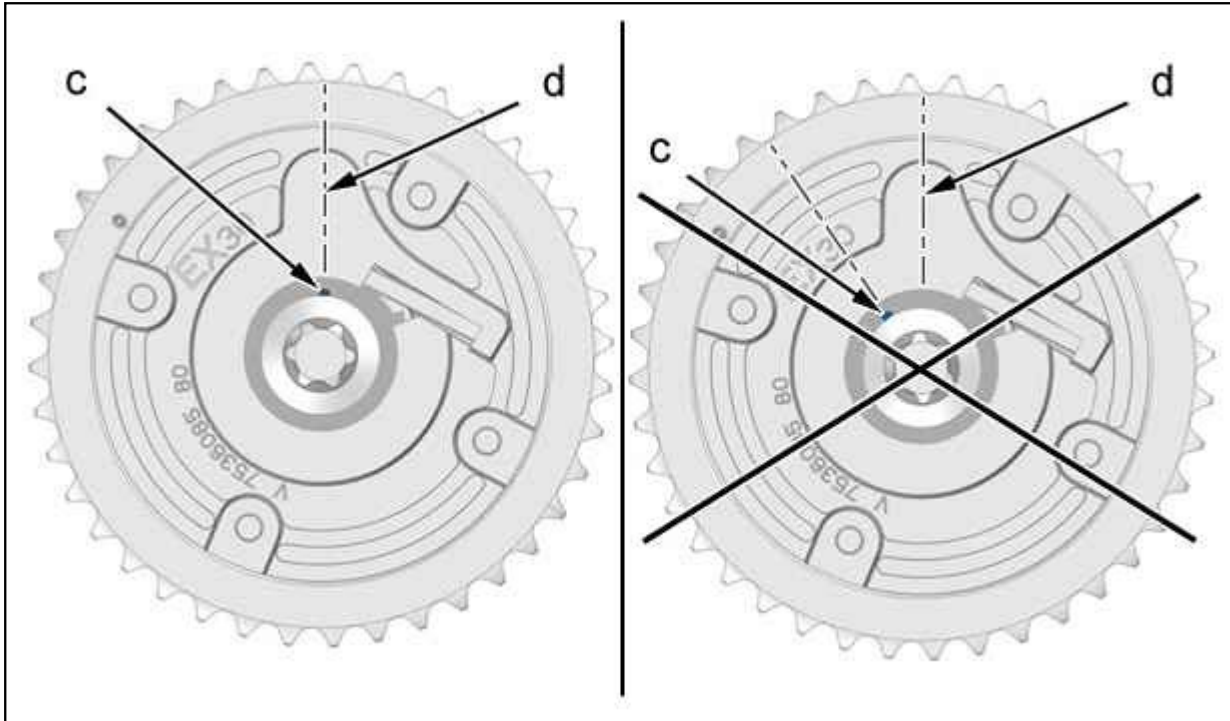


Figure : B1BG1PBD

Check that the marking "c" is aligned with the boss "d".

If the marking "c" is not aligned with the boss "d" : Go to the next stage "manual locking of dephasers".

### 3.3. Manual locking of the dephasers

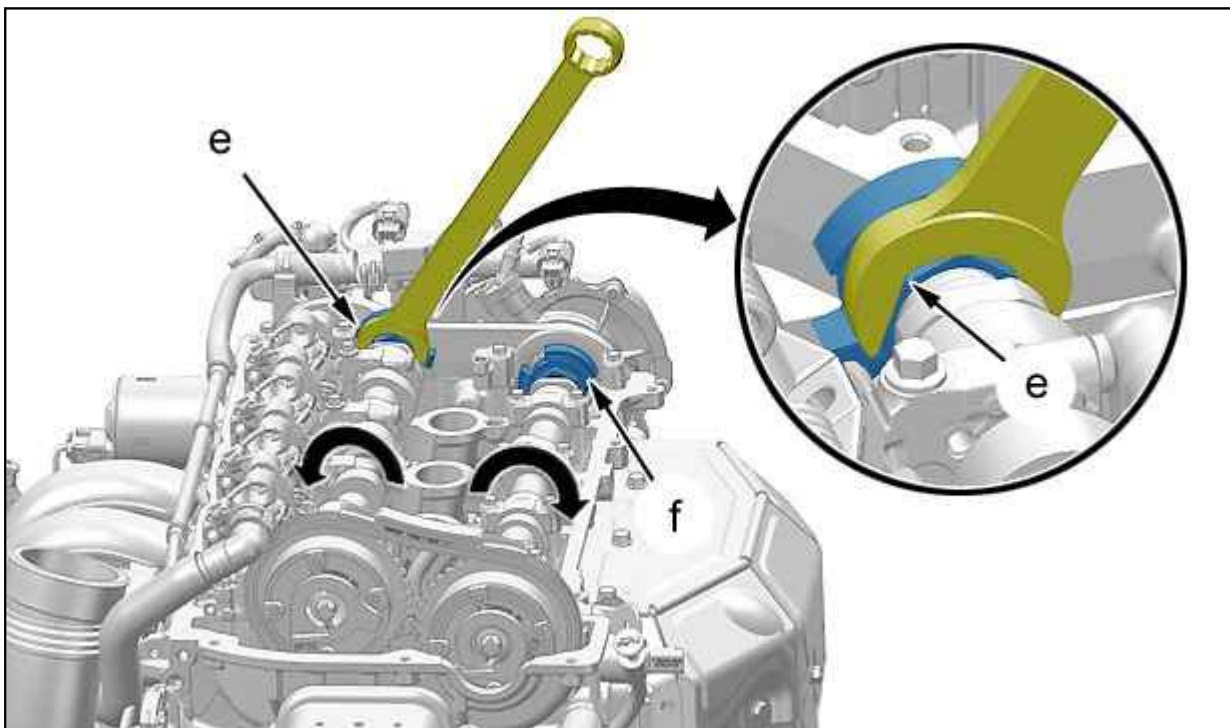


Figure : B1BG1PED

If the dephasers are not in the locked position, the camshaft can be rotated :

- Anti-clockwise (inlet side) (at "e")
- Clockwise (exhaust side) (at "f")

Make 2 rotations of the engine to make sure the camshaft dephaser(s) are correctly locked.  
If mechanical locking of the pulley is impossible ; Replace the camshaft pulley.

### 3.4. Setting the timing

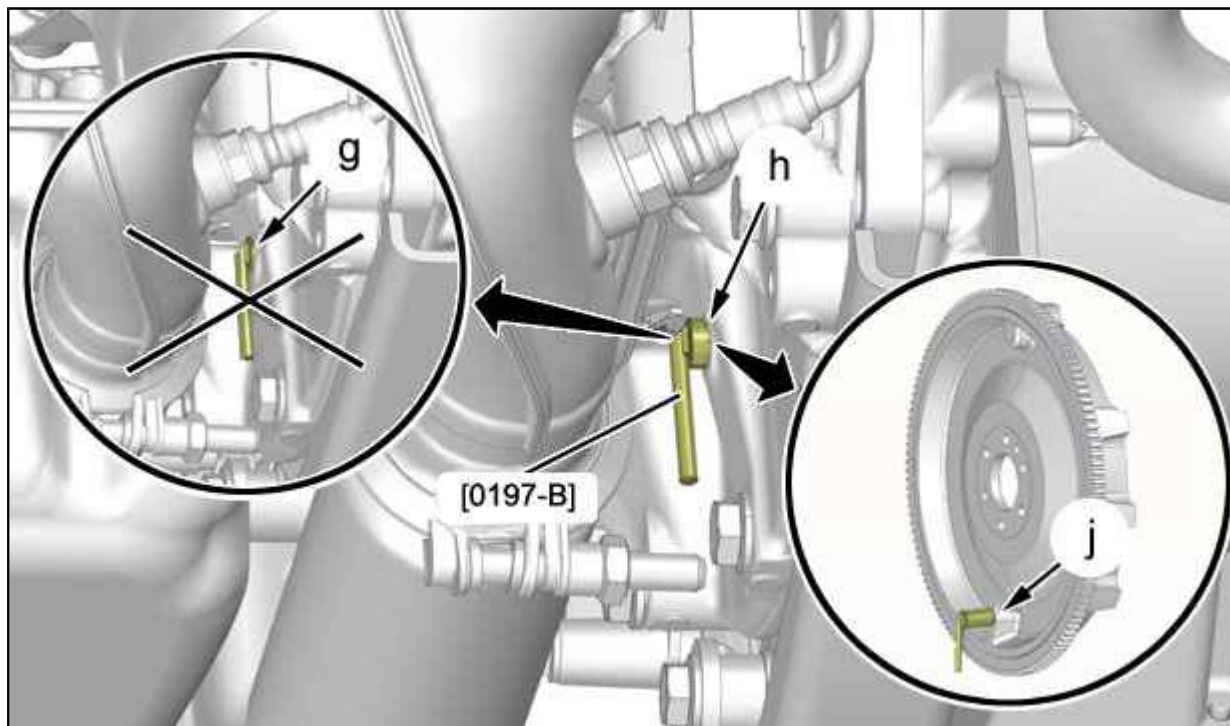


Figure : B1BG1PHD

**CAUTION :** When the engine is pegged, the pistons are in mid-travel.

**CAUTION :** If the rod goes all the way into its recess (at "g"), the flywheel is not pegged (at "j") : Repeat the operation for setting the timing.

Position the crankshaft setting pin [0197-B] in the hole "h" located on the crankshaft main bearing cap casing .  
Turn the crankshaft clockwise using the ancillary pulley bolt to the engine flywheel pegging position (at "j").  
Peg the engine flywheel ; Using the pin [0197-B].

Check that the engine is pegged correctly by trying to turn the ancillary pulley bolt anticlockwise ; Using a pipe spanner.



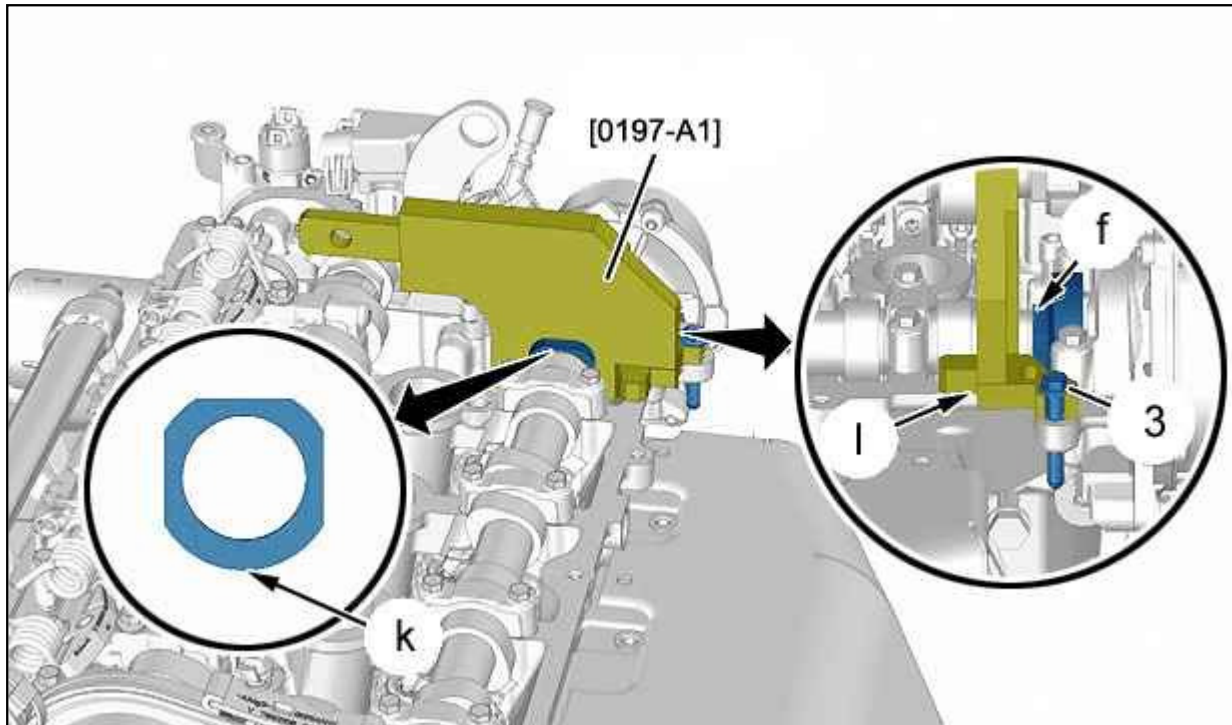


Figure : B1BG1PKD

Position the exhaust camshaft immobilisation tool [0197-A1].

**CAUTION :** The rounded contour of the pegging zone on the camshafts must be oriented downwards (at "k"), the 3 other flat zones receiving the setting tool.

**N.B. :** To facilitate the assembling of the tool [0197-A1], you can slightly rotate the exhaust camshaft (clockwise and anti-clockwise) (at "f") ; Using a 27 mm combination spanner.

**CAUTION :** The tool [0197-A1] must be firmly against the sealing face of the cylinder head (at "l"); no lifting of the tool is authorised.

Secure the tool [0197-A1] ; With the bolt (3).

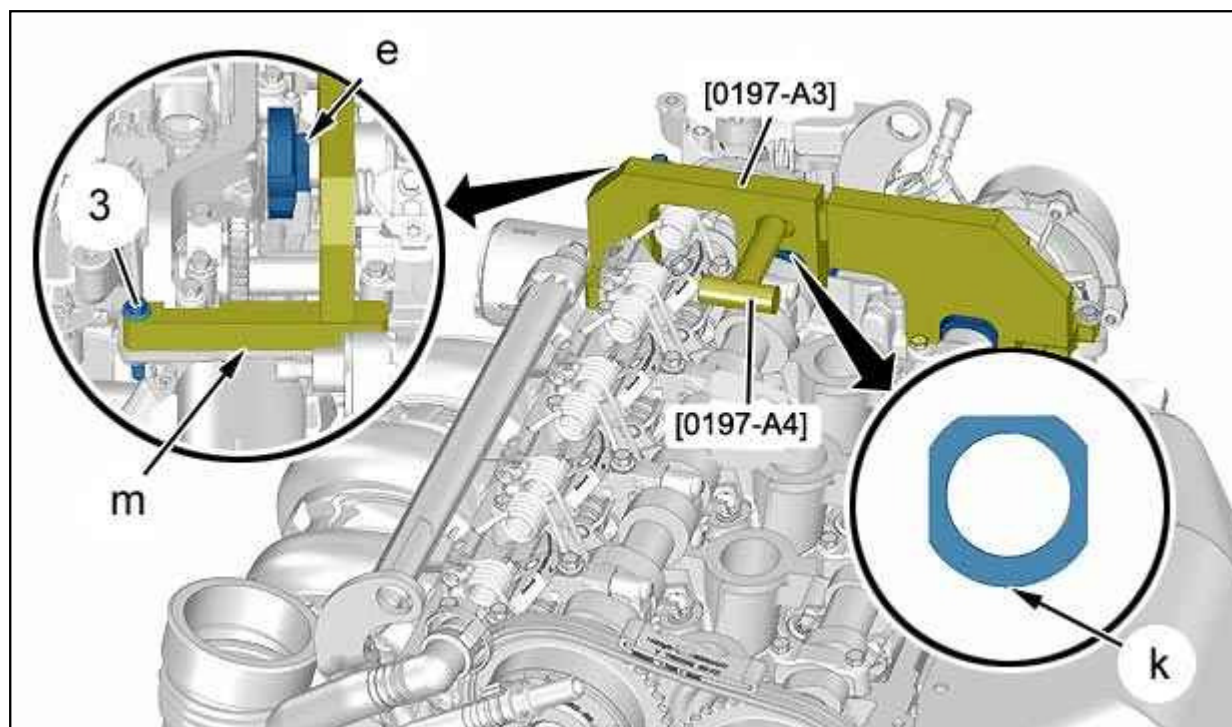


Figure : B1BG1PND

Position the inlet camshaft immobilisation tool [0197-A3].

Assemble the camshaft immobilisation tools [0197-A1], [0197-A3] ; With the bolt [0197-A4].

**CAUTION :** The rounded contour of the pegging zone on the camshafts must be oriented downwards (at "k"), the 3 other flat zones receiving the setting tool.

**N.B. :** To facilitate assembly of the tool [0197-A3], you can rotate the inlet camshaft slightly (clockwise and anti-clockwise) (at "e") ; Using a 27 mm combination spanner.

**CAUTION :** The tool [0197-A3] must be firmly against the sealing face of the cylinder head (at "m"); no lifting of the tool is authorised.

Secure the tool [0197-A3] ; With the bolt (3).



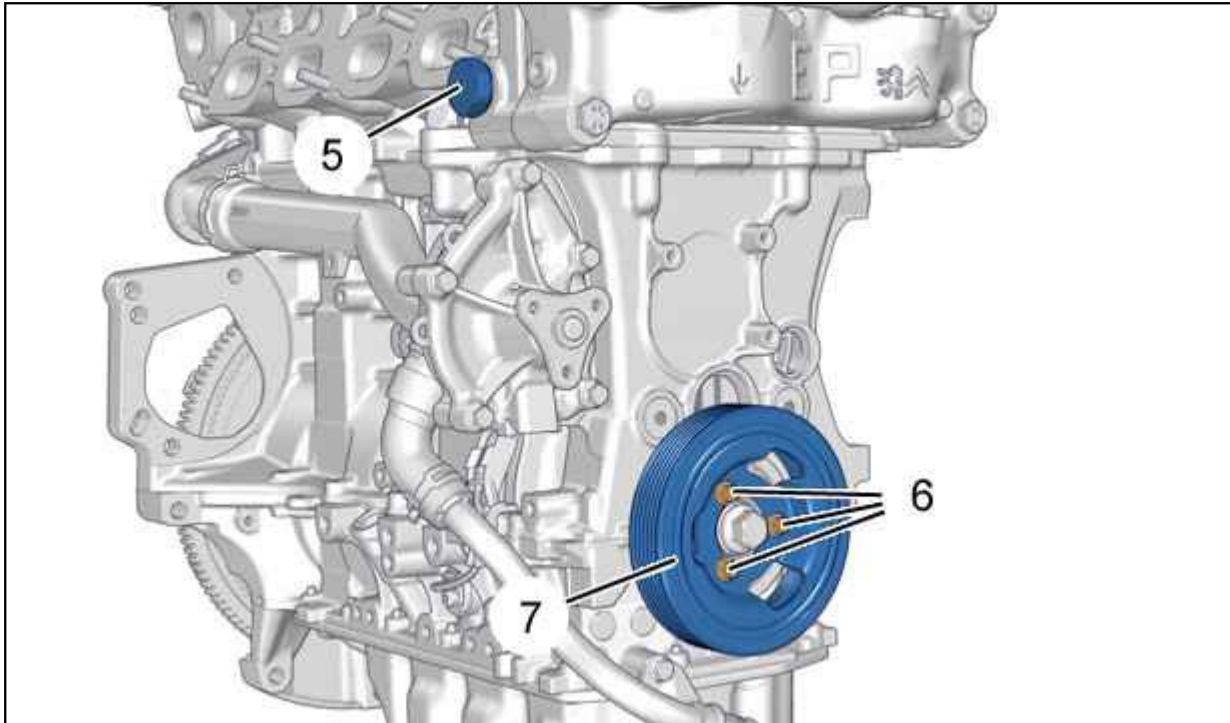


Figure : B1BG1PSD

Remove : The chain tensioner (5).

Remove :

- The bolts (6)
- The crankshaft pulley (7)

### 3.5. Checking the wear of the timing chain assembly

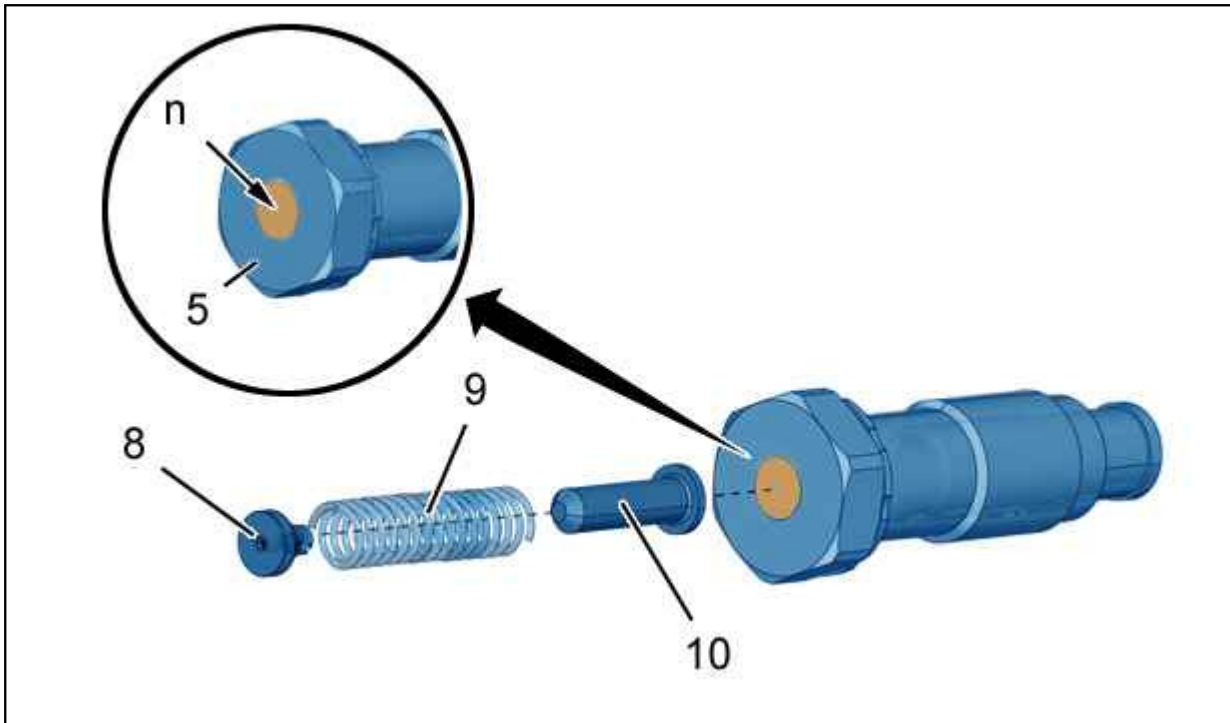


Figure : B1BG1PWD

**CAUTION :** It is essential to keep to the approved method for fitting the dummy chain tensioner ; Do not weld the piston on the tensioner ; Risk of overtensioning the timing chain.

Drill the old timing chain tensioner (5) to the diameter 10,75 mm (at "n").

**N.B. :** Release the ball valve (8) as necessary ; Using a pin drift.

Remove :

- The ball valve (8)
- The spring (9)
- The valve guide (10)

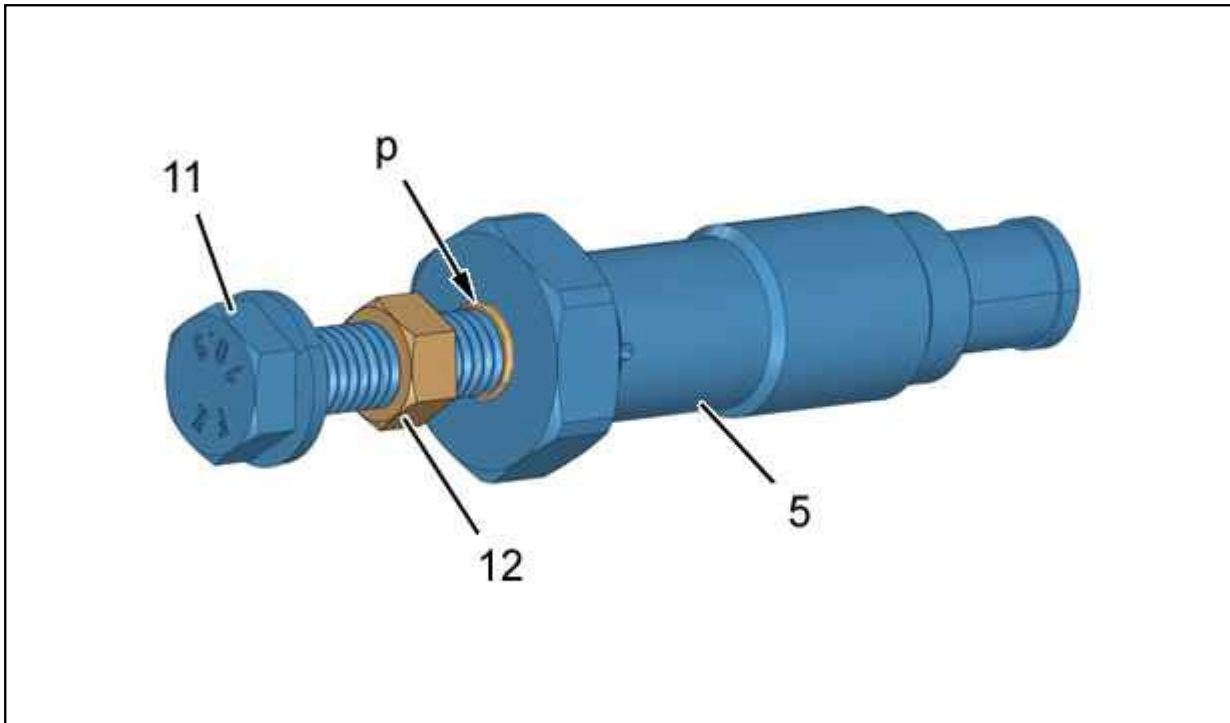


Figure : B1BG1Q1D

**CAUTION :** Thoroughly clean the body of the chain tensioner (5) of any signs of swarf.

Fit a separate thread of the "helicoil" type, diameter M10x150 (at "p").

Do up :

- A nut M10 (12) onto a bolt or a threaded rod (11), diameter M10x150, length 100 mm
- The assembly (11), (12) onto the body of the tensioner (5)

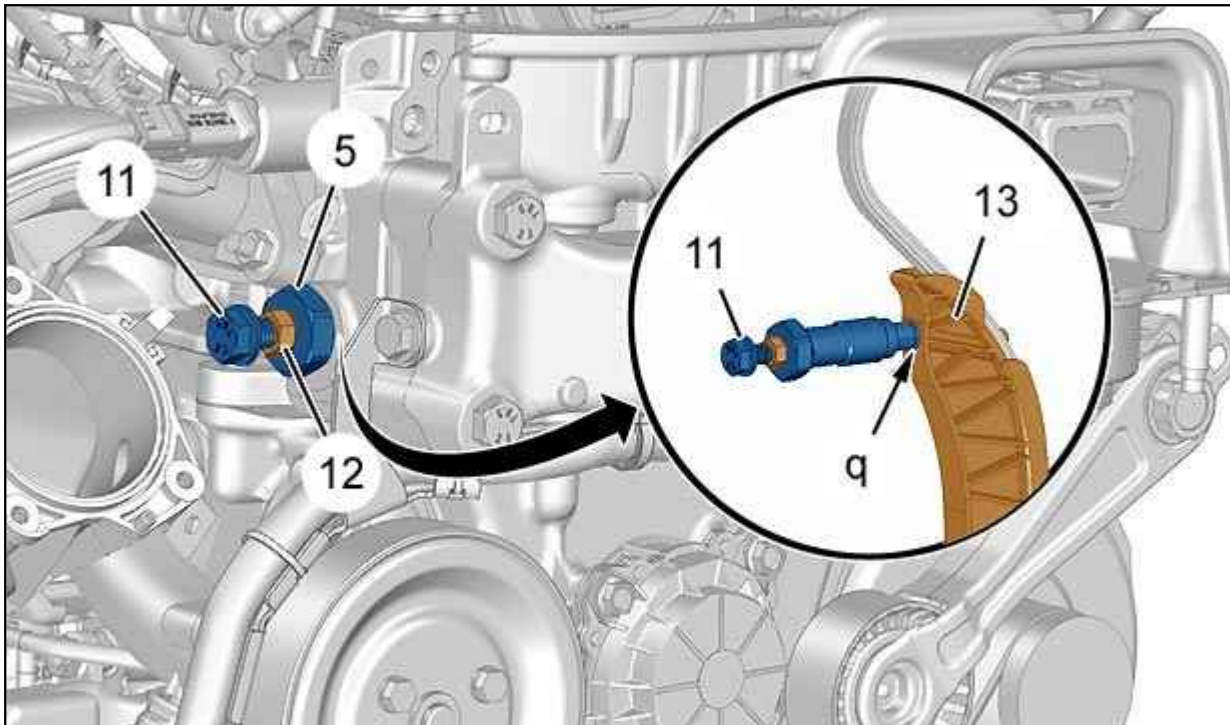


Figure : B1BG1Q2D

**CAUTION :** Oil the threads of the bolt (11).

Tighten the body of the dummy timing chain tensioner (5) on the cylinder head (Without a seal).

Tighten the bolt (11) of the dummy timing chain tensioner until there is contact (at "q") with the chain tensioner guide (13) so as to prevent it from going backwards ; Tightening torque 0,06 m.daN, or hand-tighten (without a spanner) as much as possible.

Lock the assembly by means of a lock nut (12).

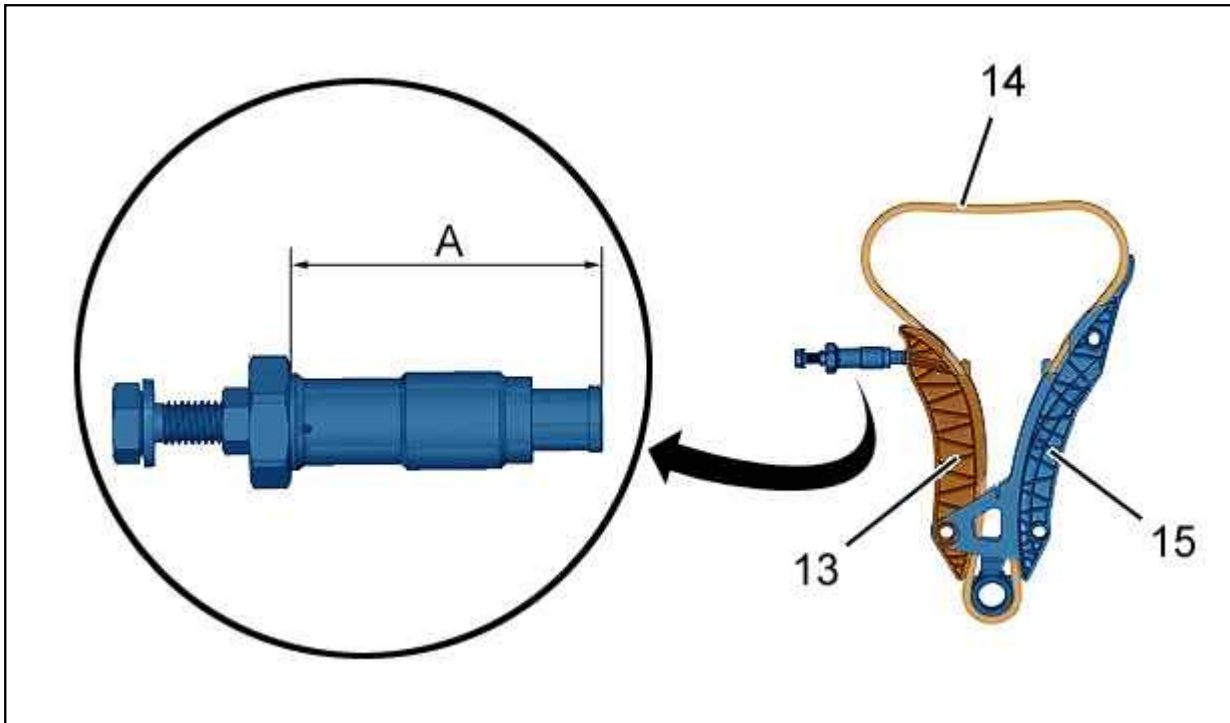


Figure : B1BG1Q4D

**CAUTION :** The timing chain may jump a tooth while you are removing the dummy chain tensioner, if the tools pegging the camshafts [0197-A1], [0197-A3] have been taken away.

Remove the dummy tensioner (5) and note down the dimension "A" between the contact face of the tensioner and the extremity of the piston (Without a seal).

If the dimension is less than or equal to 73,5 mm : The timing chain assembly shows no wear and can be refitted.

If the dimension is greater than 73,5 mm ; Replace :

- The timing chain (14)
- The chain guides (13), (15)
- The upper chain guide
- The chain tensioner (5)

### 3.6. Removing the timing chain assembly

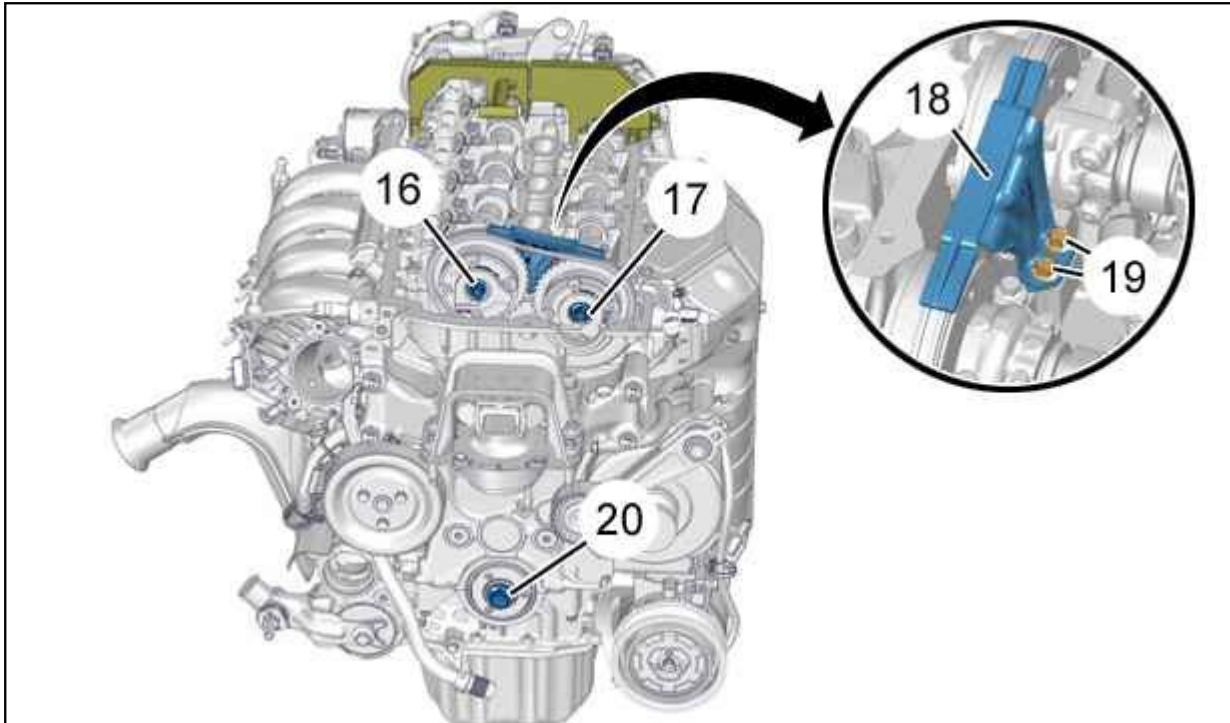


Figure : B1BG1Q7D

Remove :

- The 2 bolts (19)
- The upper chain guide (18)

Unscrew :

- The securing bolts (16), (17)
- The securing bolt (20)



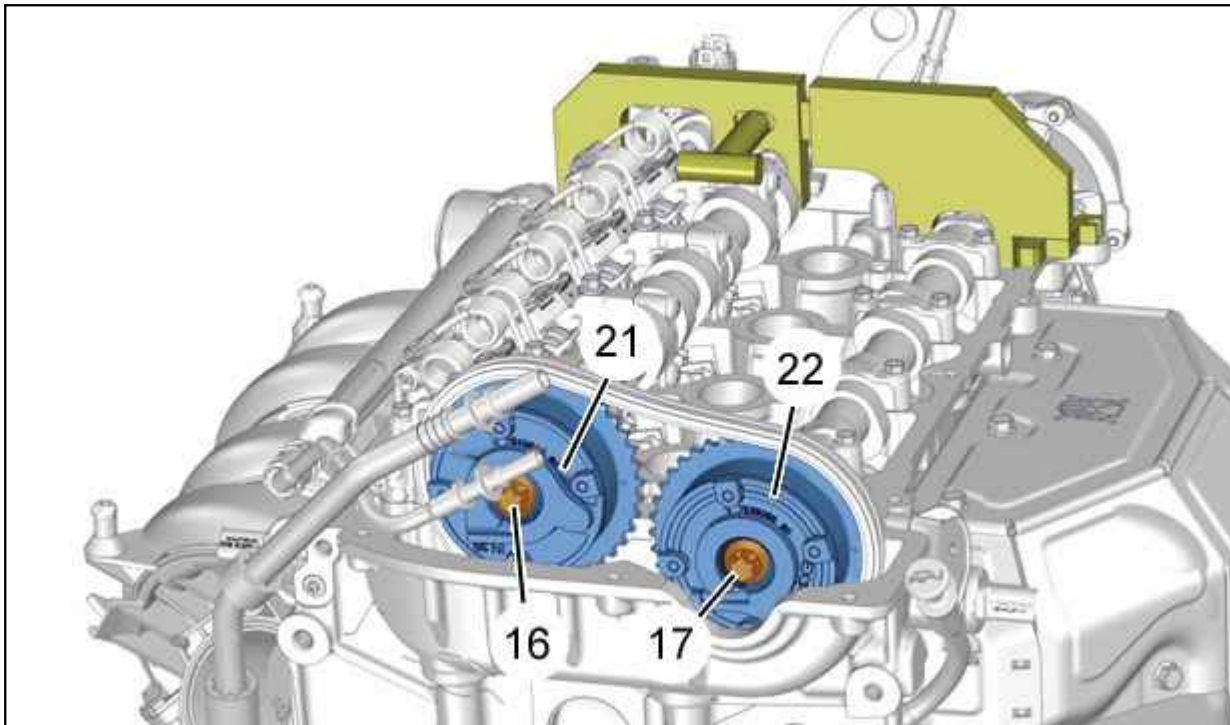


Figure : B1BG1Q8D

Remove :

- The securing bolt (16)
- The inlet camshaft pinion (21)
- The securing bolt (17)
- The exhaust camshaft gear (22)

Place the tool [0197-E] in the location of the upper chain guide (18) to support the chain (14).

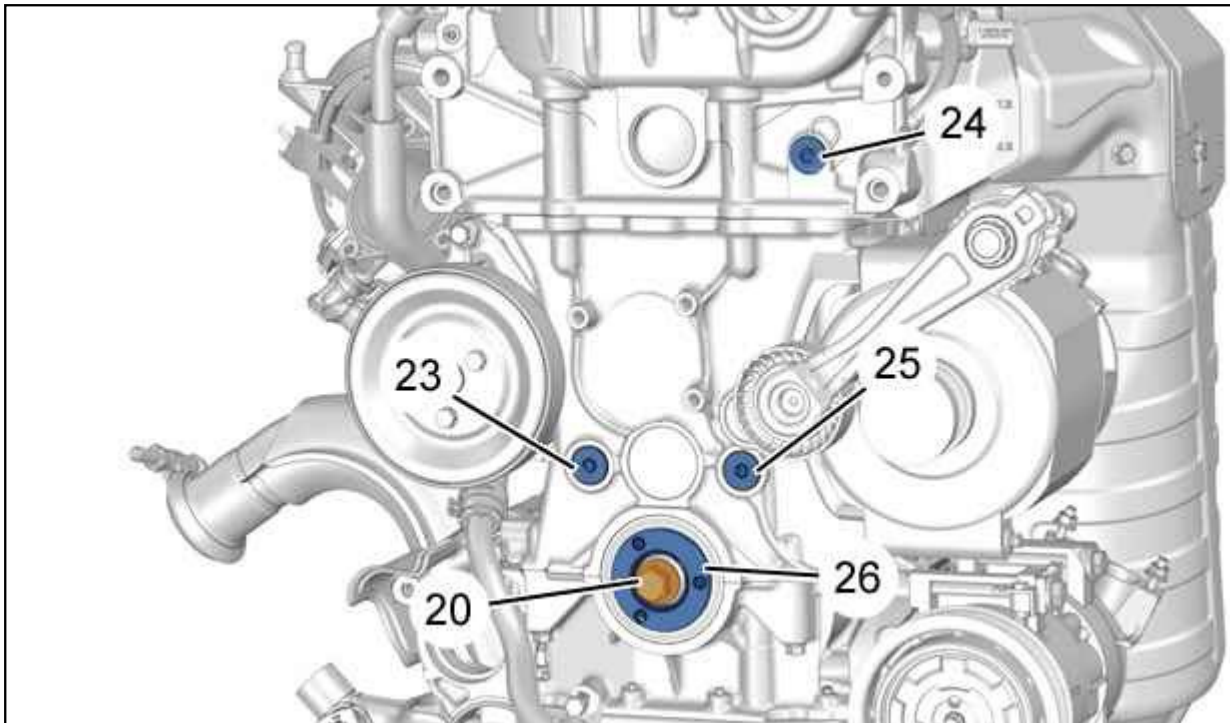


Figure : B1BG1QCD

Remove :

- The (23) bolt
- The bolt (24)
- The bolt (25)
- The bolt (20)
- The crankshaft hub (26)

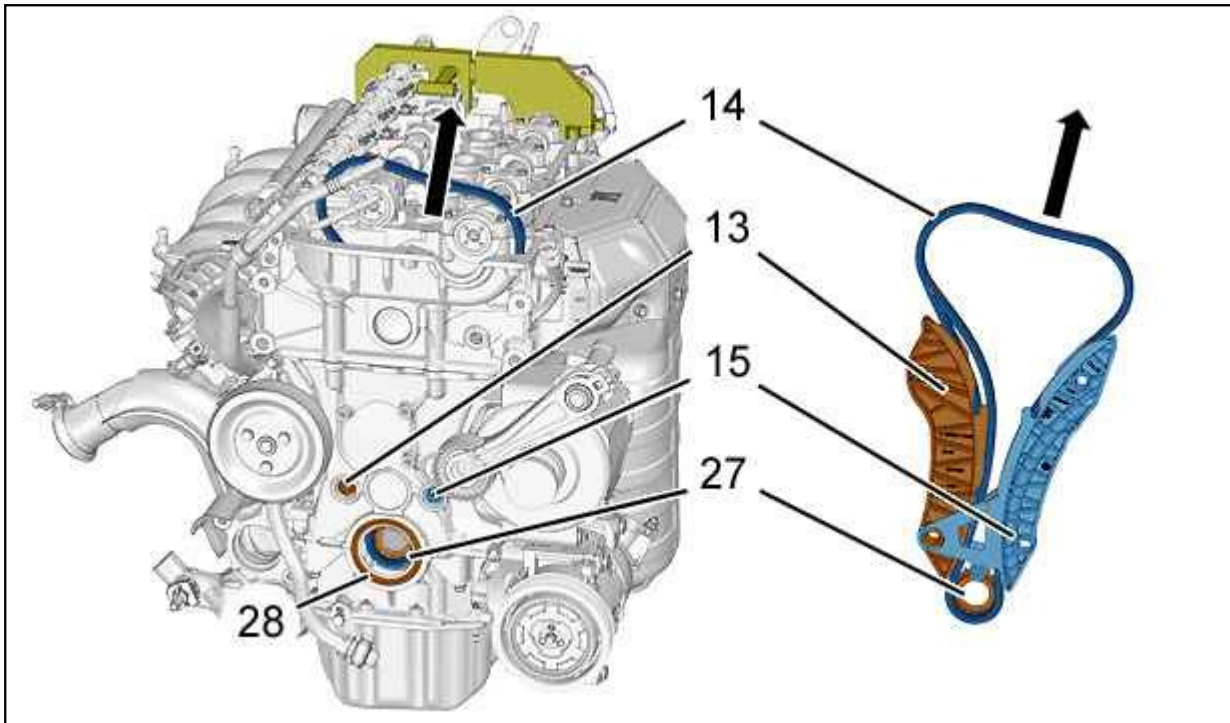


Figure : B1BG1QDD

Remove : The timing chain assembly (14) (Following the arrow ) :

- The tensioner guide (13)
- The fixed guide (15)
- The crankshaft gear (27)

Remove the sealing ring (28).

#### 4. Removing the cylinder head

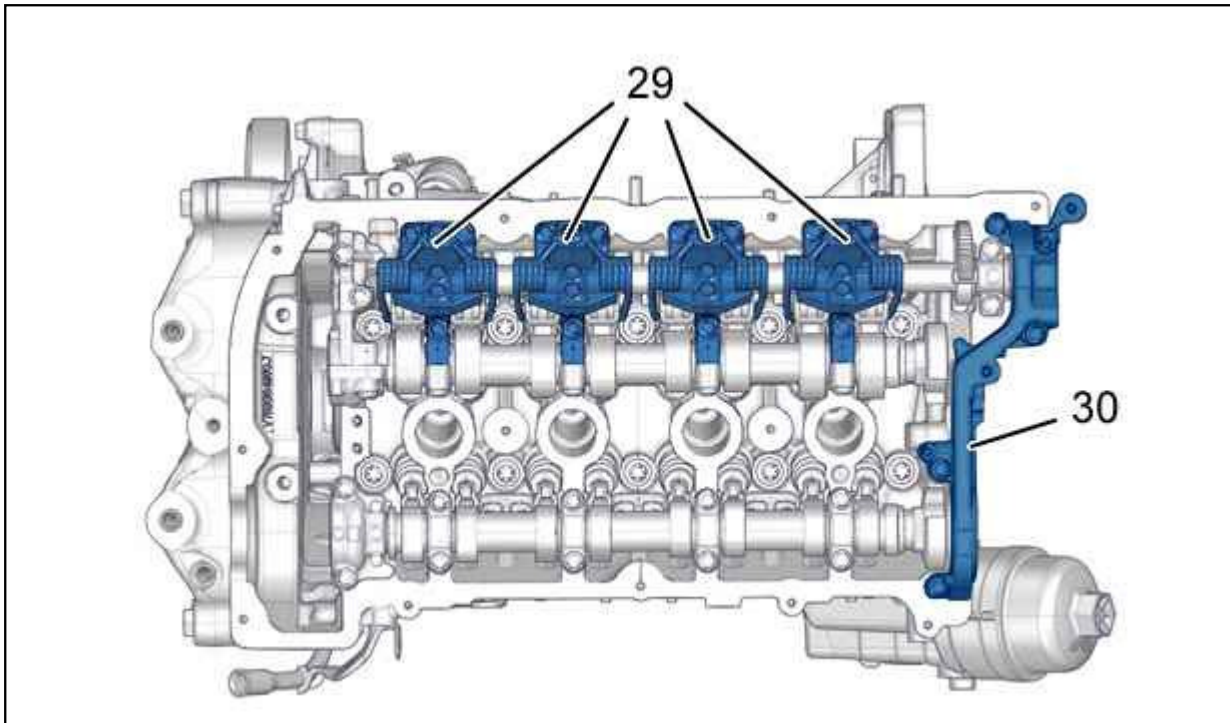


Figure : B1BG1QED

**CAUTION** : Do not remove the screws from the camshafts double bearing (30).

**URGENT** : Danger : Any operation on the variable lift assembly (29) is prohibited without referring to the method for removing the camshafts; serious risk of injury.

#### 4.1. Removing the cylinder head bolts

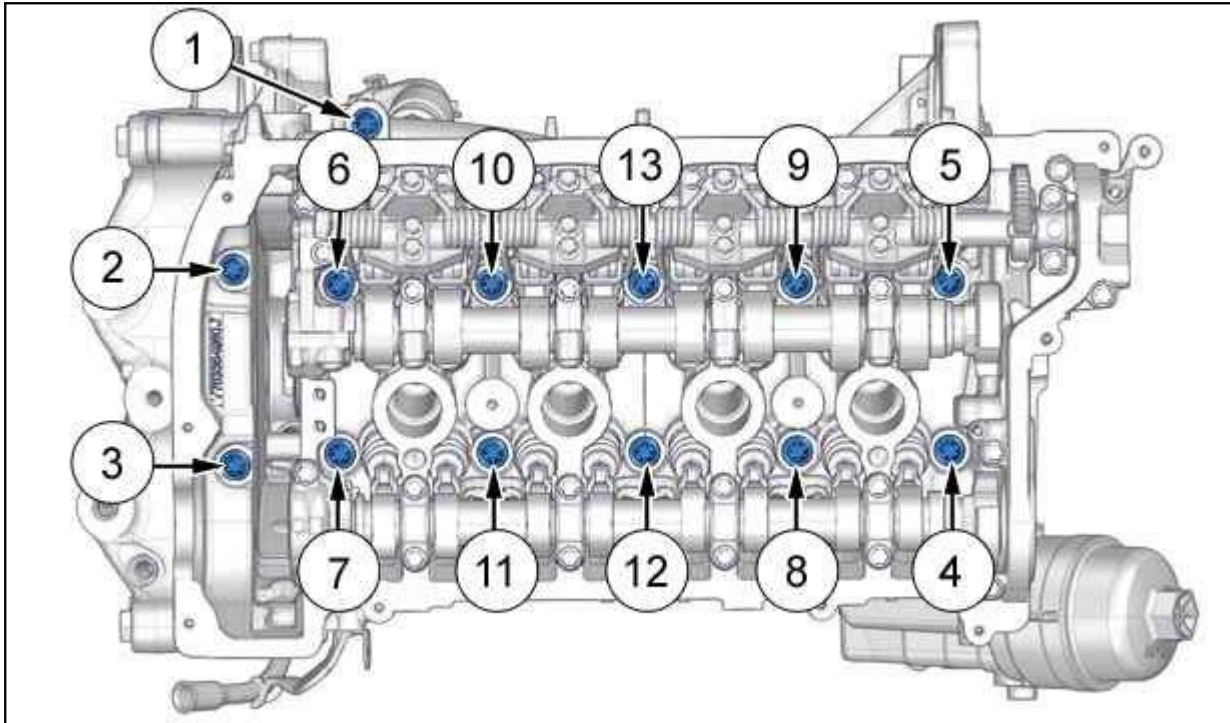


Figure : B1BG1QHD

Remove :

- The cylinder head bolts (In the order from 1 to 3)
- The cylinder head bolts (In the order from 4 to 13)
- The cylinder head
- The cylinder head gasket

#### 4.2. Removing the oil anti-return valves



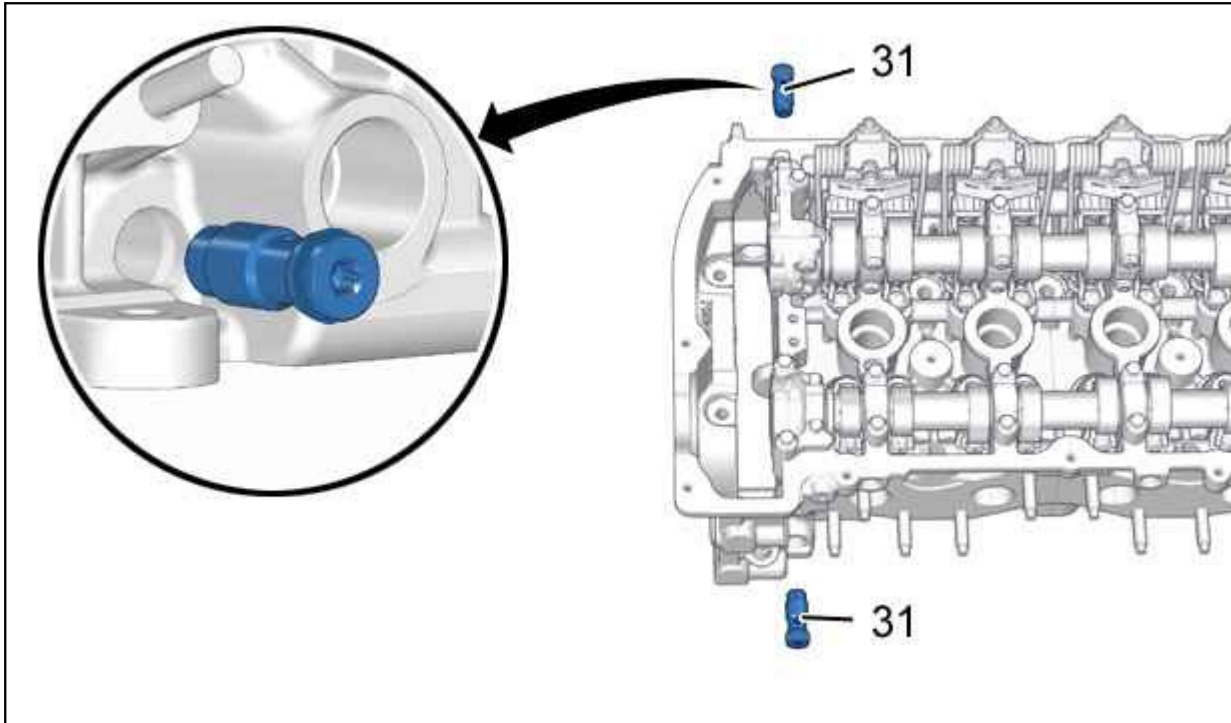


Figure : B1BG1QID

Remove : The oil anti-return valves (31).

## 5. Removing the camshafts

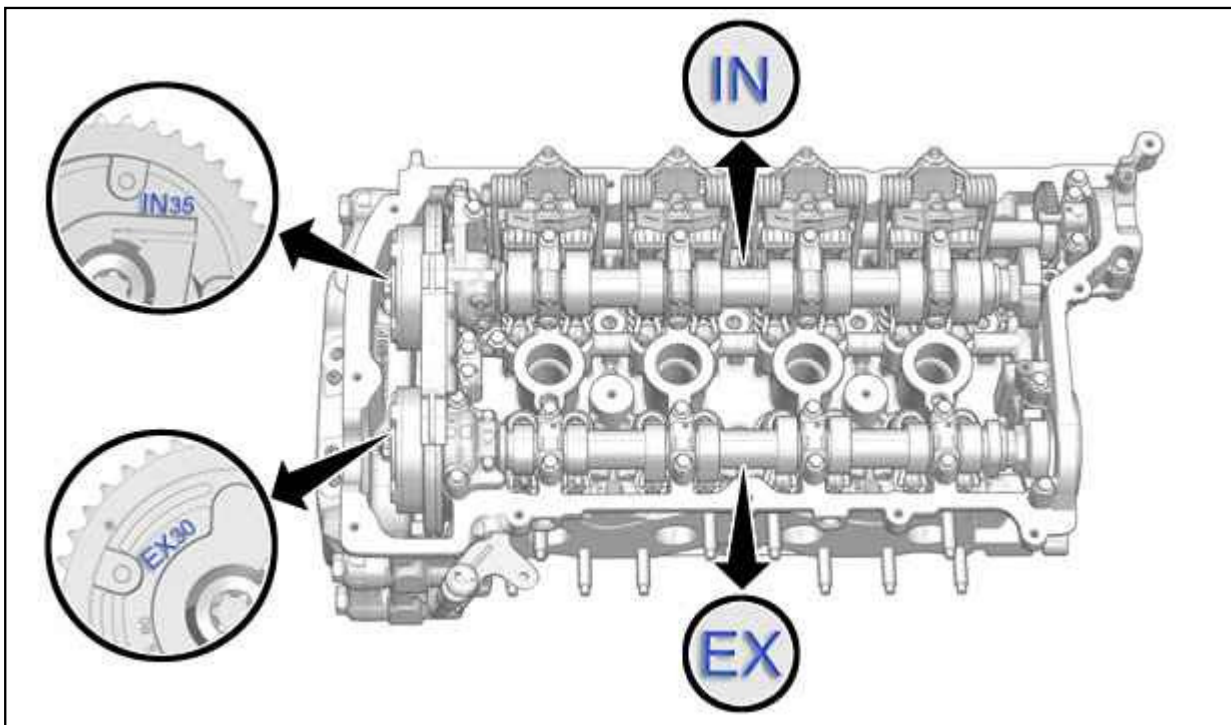


Figure : B1EG0CRD



**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.

### 5.1. Removing : Exhaust camshaft

Remove the camshaft immobilisation and setting tools [0197-A1], [0197-A3].

Position the cylinder head on a cylinder head support [Type facom U43].

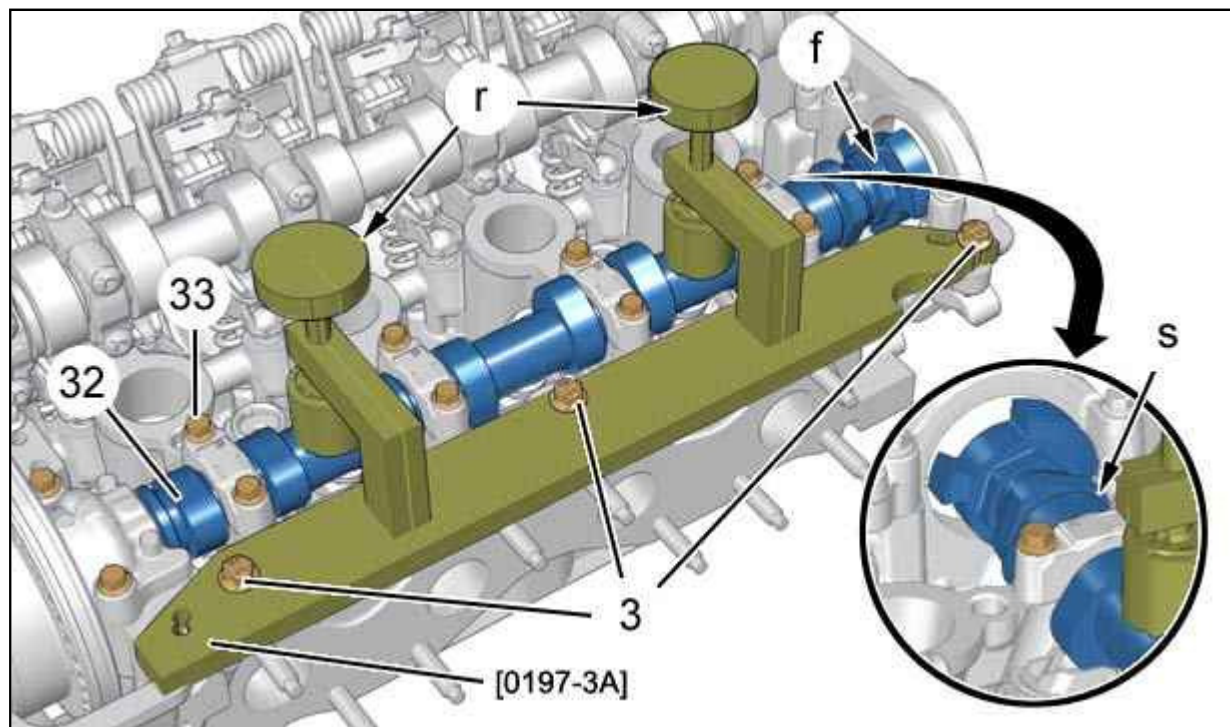


Figure : B1BG1QND

**CAUTION :** Turn the camshaft (32) clockwise by around 30° (at "f") ; The upper surface of the cam "s" should be inclined by around 30°.

Fit :

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

Tighten the controls "r" to retain the exhaust camshaft in its housing (32).

Remove the bolts (33).

Mark : The camshaft bearing caps .

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

Remove :

- The tool [0197-3A]
- The bolts (3)
- The camshaft bearing caps (mark their position)

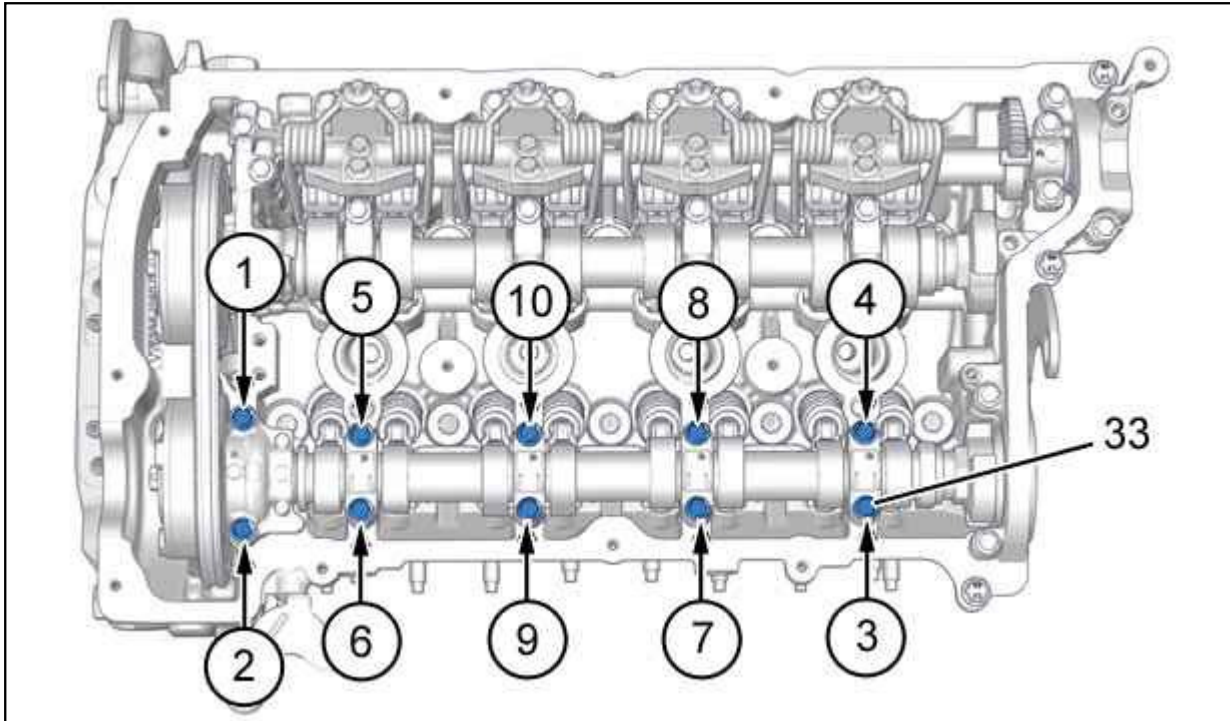


Figure : B1BG1QRD

**CAUTION :** Observe the order of slackening indicated for the main bearing bolts (33).

## 5.2. Removing : Variable lift springs

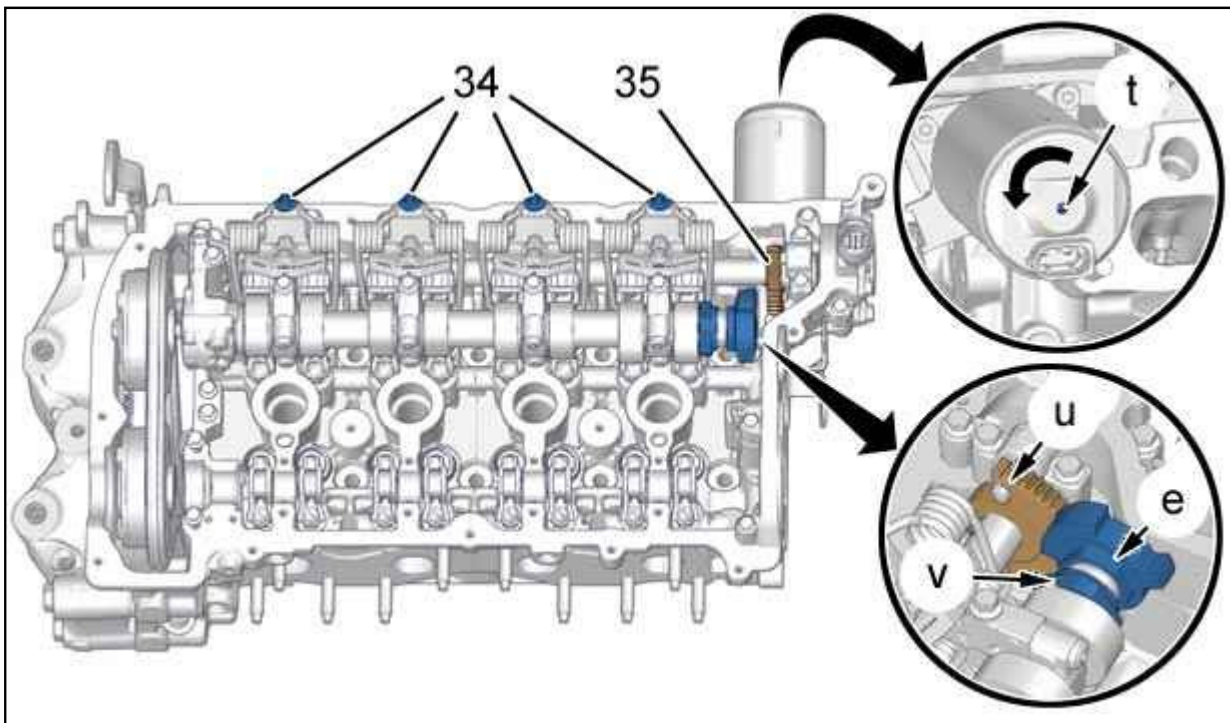


Figure : B1BG1QSD

**URGENT** : Do not remove the screws (34) from the variable lift springs without using the tool [0197-3B1].

**CAUTION** : Position the eccentric shaft prior to removal : The toothed quadrant (35) has to be at the stop "u", if it is not, turn the bolt "t" anticlockwise until it is at the stop ; Using a 4mm 6-sided spanner.

**CAUTION** : Turn the inlet camshaft anticlockwise by approximately 30° (at "e"). The upper surface of the cam "v" should be inclined by around 30°.

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

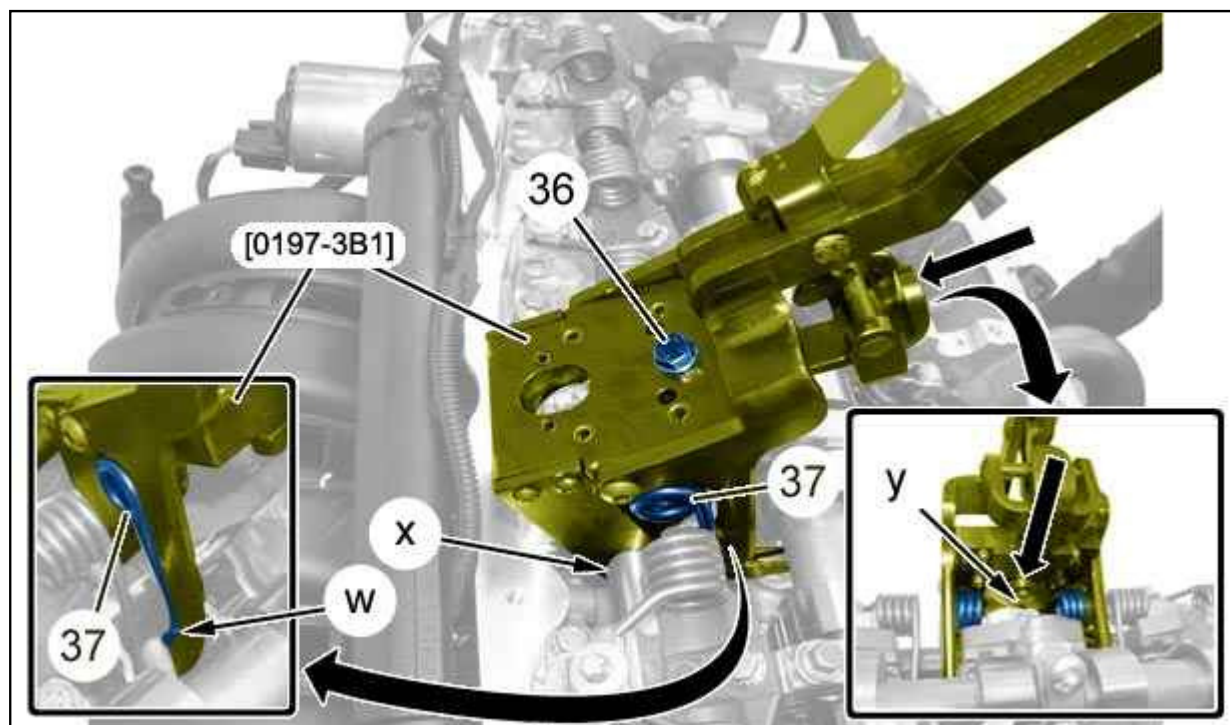


Figure : B1BG1QTD

Fit the tool [0197-3B1] :

- Press the tool [0197-3B1] onto the eccentric shaft (at "x")
- Position the jaws of the tool [0197-3B1] on the spring (37) (at "w")
- Push the locking lug against the bearing (at "y")
- Tighten the screw (36) to retain the spring (37)



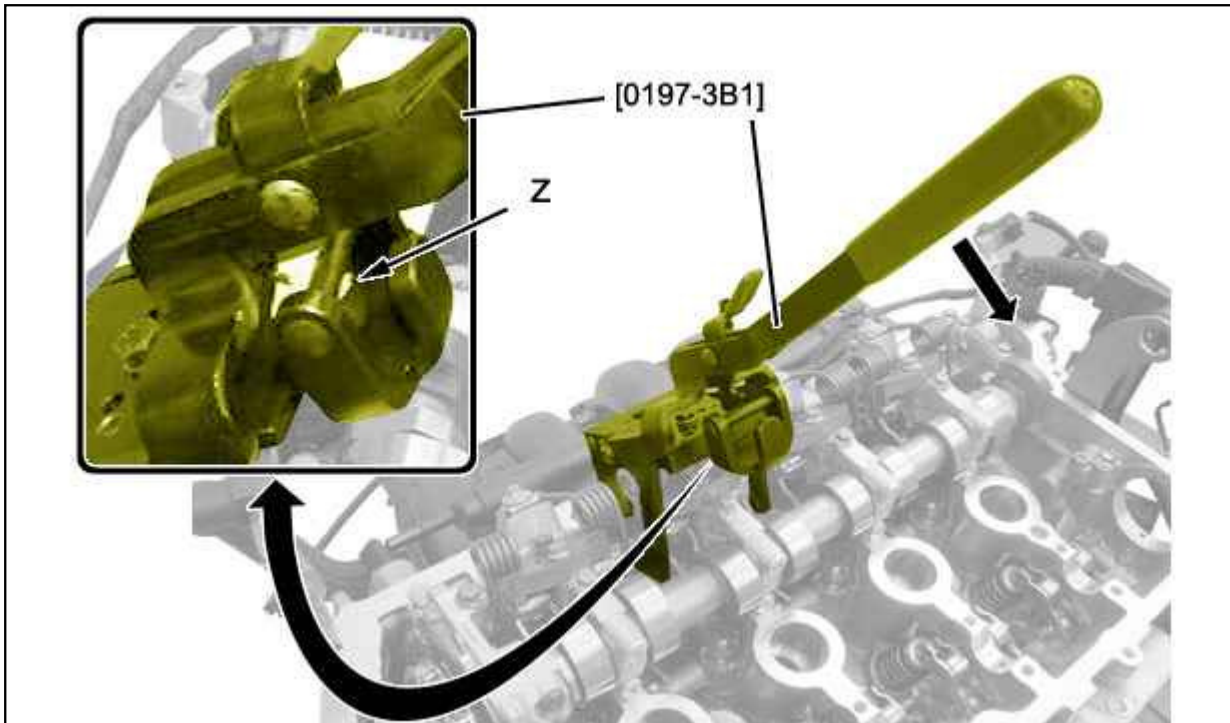


Figure : B1BG1QWD

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

**CAUTION :** The lock should be engaged (at "z") ; If the lock is not engaged at "z", slacken the screw (36) and push the locking lug onto the bearing (at "y").

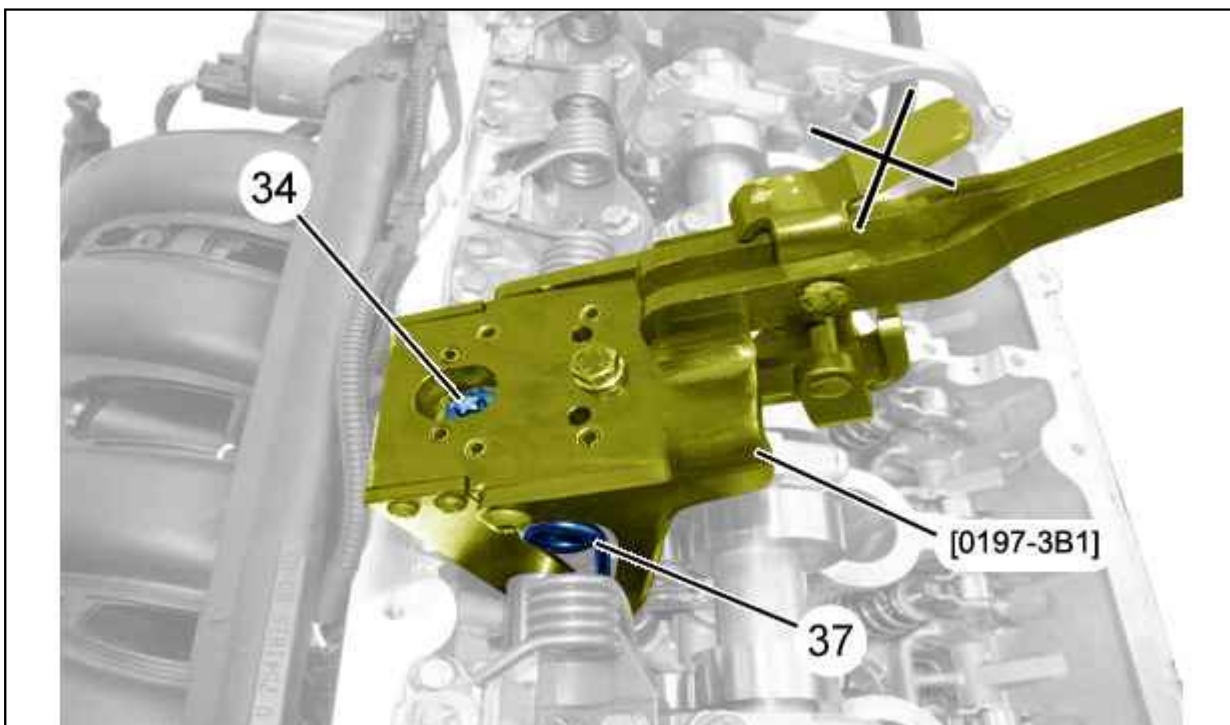


Figure : B1BG1QYD

**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 the bolt (34).

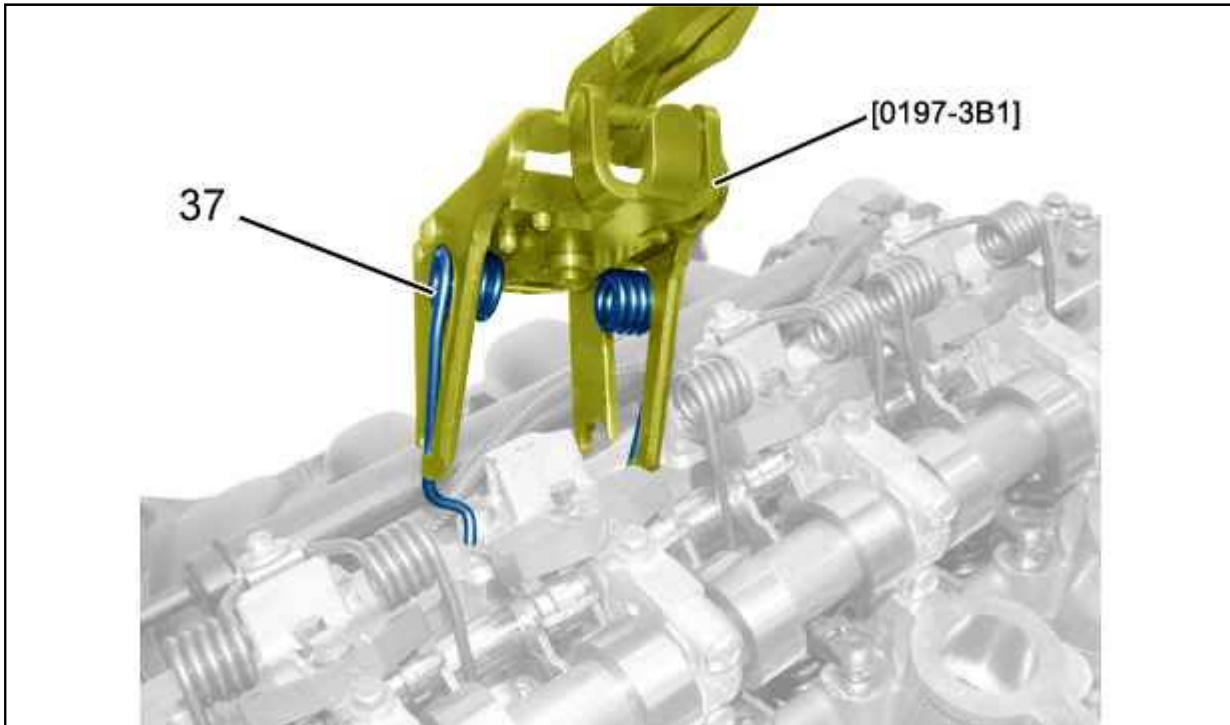


Figure : B1BG1QZD

Remove the tool [0197-3B1] together with the spring (37).

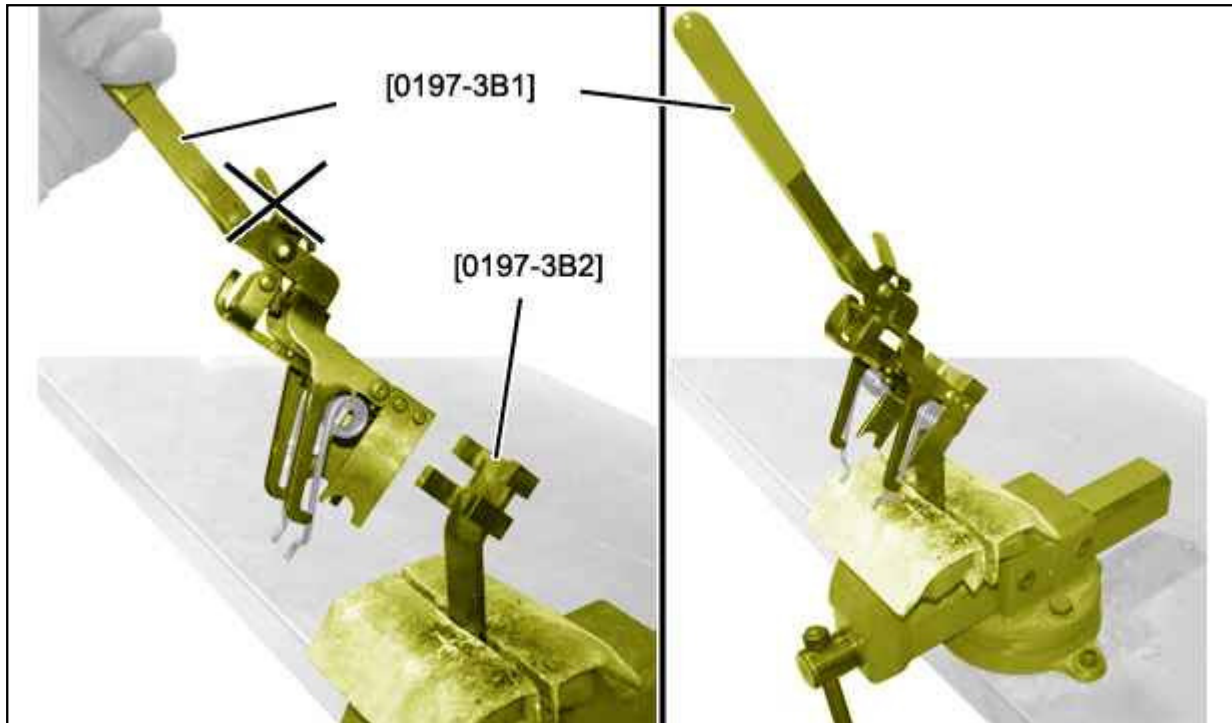


Figure : B1EG0CTD

**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.

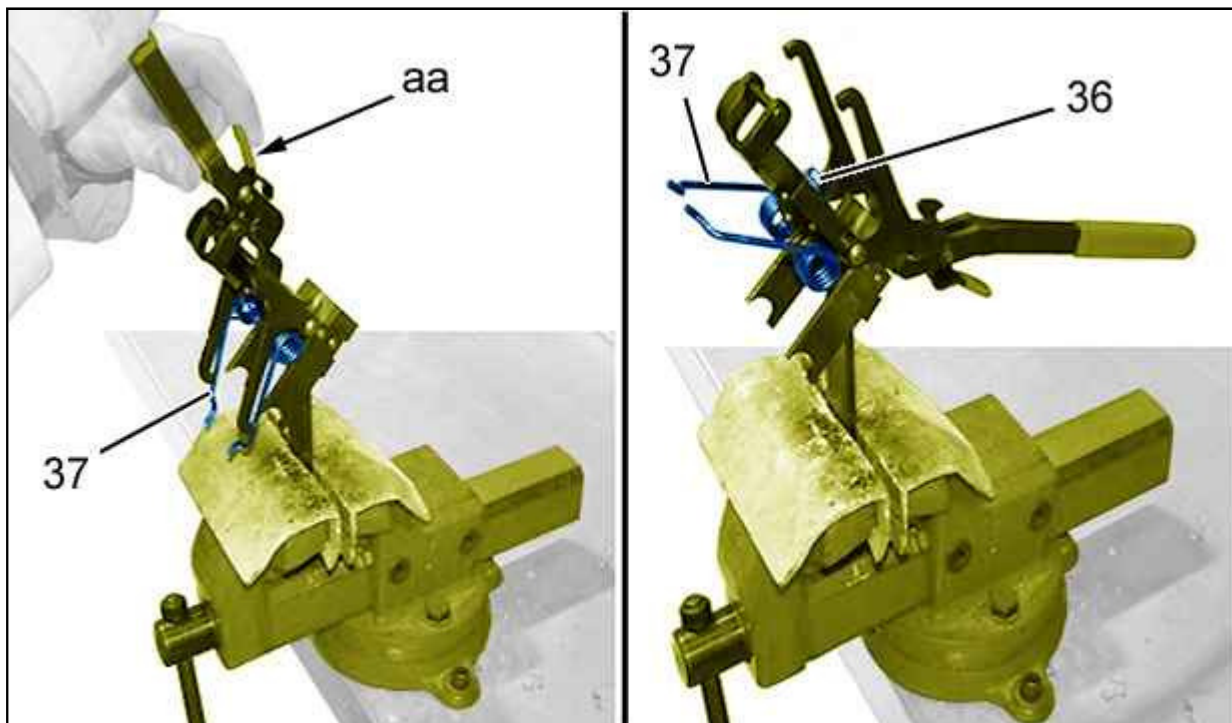




Figure : B1BG1R7D

Unlock the tools [0197-3B1] (at "aa") ; Detension the spring (37) slowly.

Remove :

- The bolt (36)
- The spring (37)

Repeat the operation on the other springs (37).

### 5.3. Removing : Induction camshaft

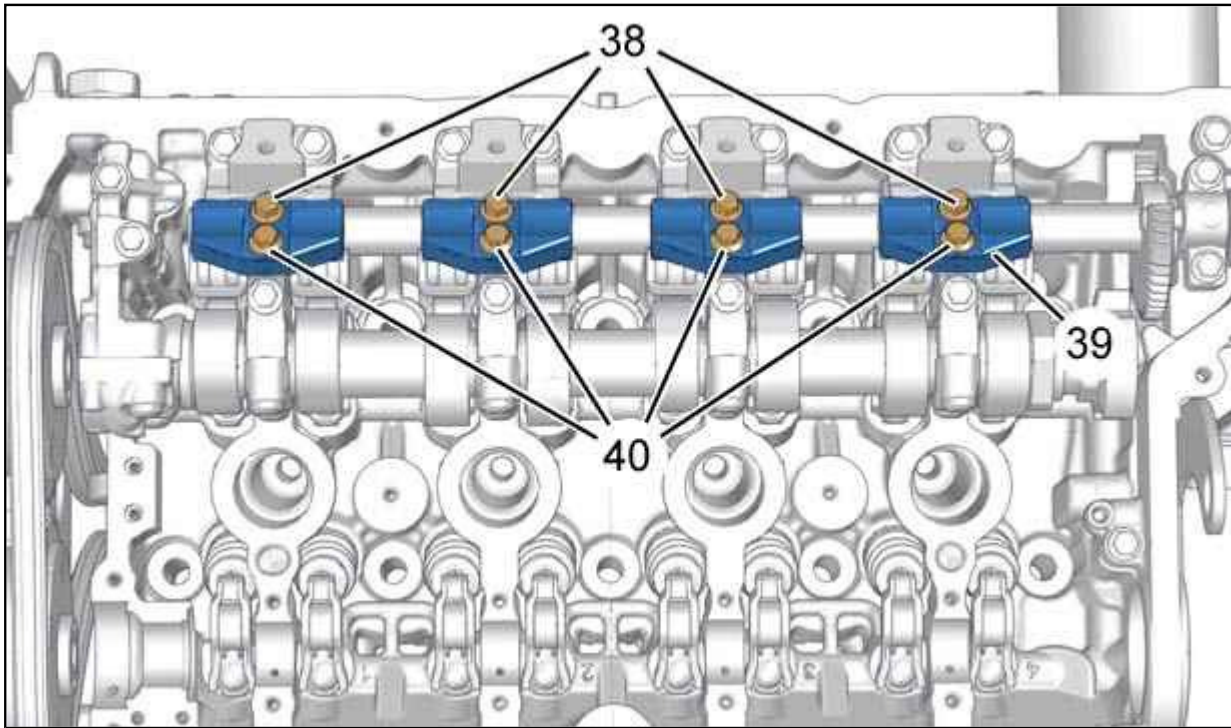


Figure : B1BG1R9D

Remove :

- The bolts (38)
- The bolts (39)
- The guides (40)

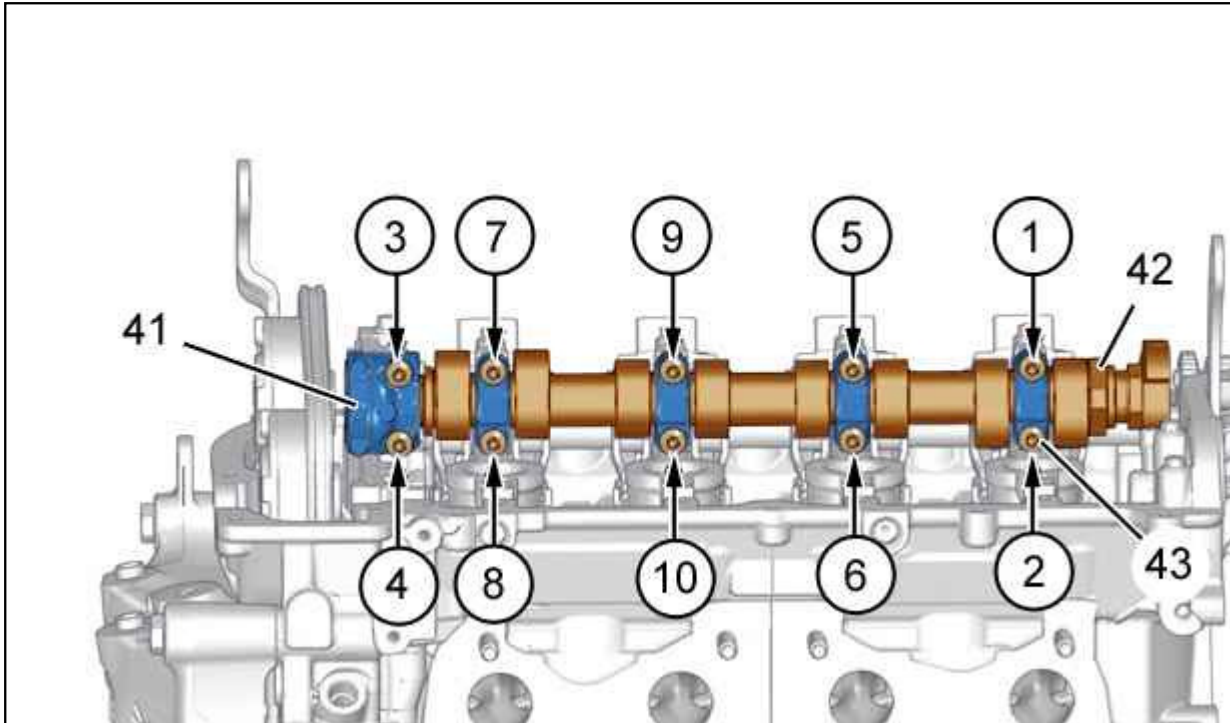


Figure : B1BG1RBD

Remove :

- The bolts (43)
- The camshaft bearing caps (41)
- The inlet camshaft (42)

#### 5.4. Removing : Eccentric shaft, variable lift rockers

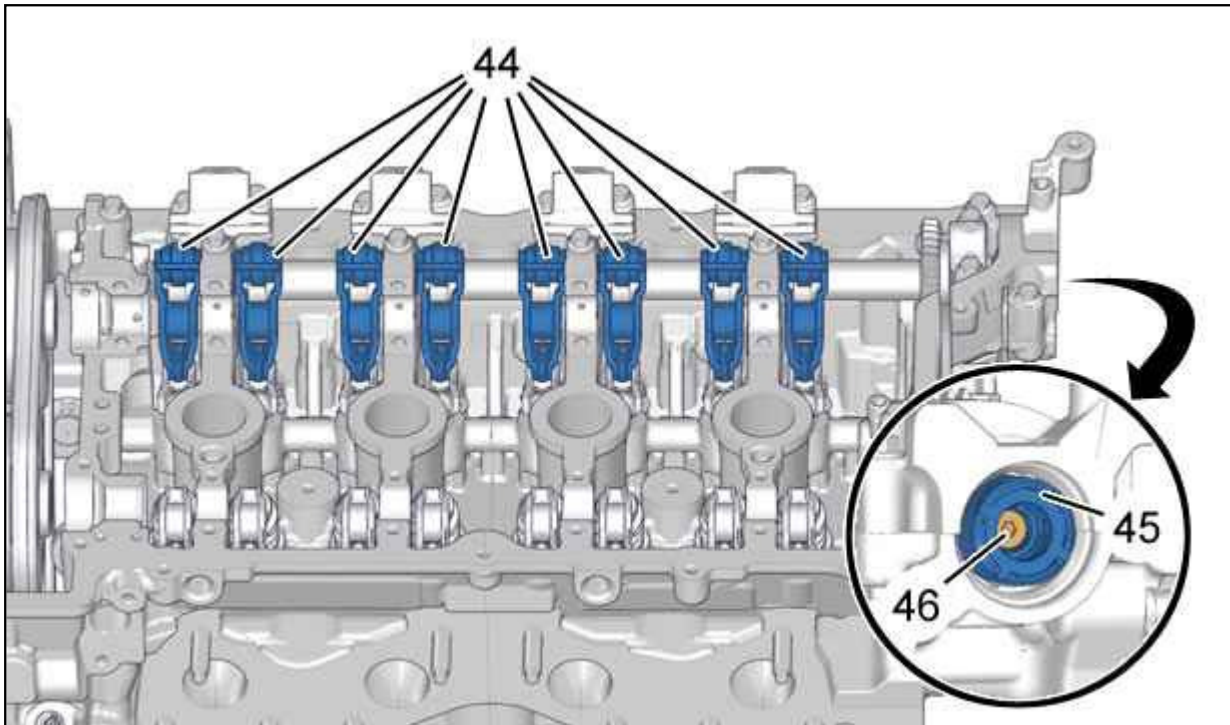


Figure : B1BG1RCD

**CAUTION :** Mark the positions of the variable lift valve rockers (44).

Remove :

- The variable lift valve rockers (44)
- The variable lift motor
- The bolt (46)
- The eccentric shaft target (45)

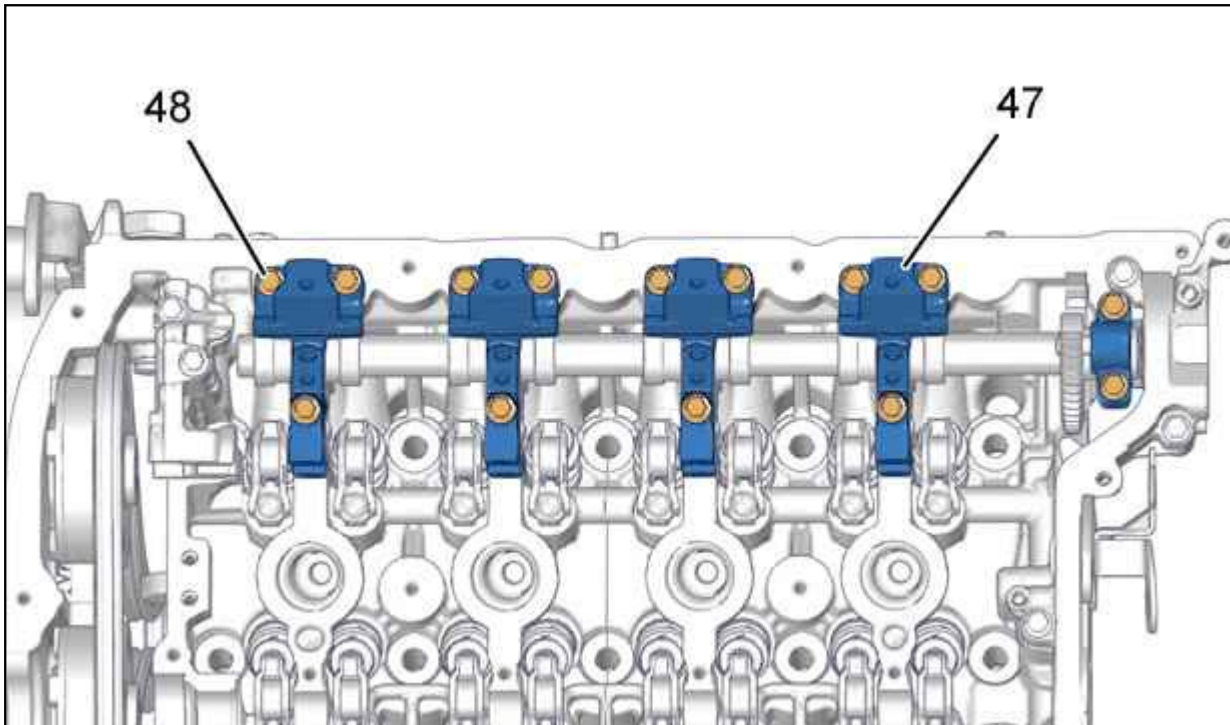


Figure : B1BG1RDD

Remove :

- The bolts (48)
- The main bearings of the eccentric shaft/inlet camshaft (47)

## 6. Removing the rockers and tappets

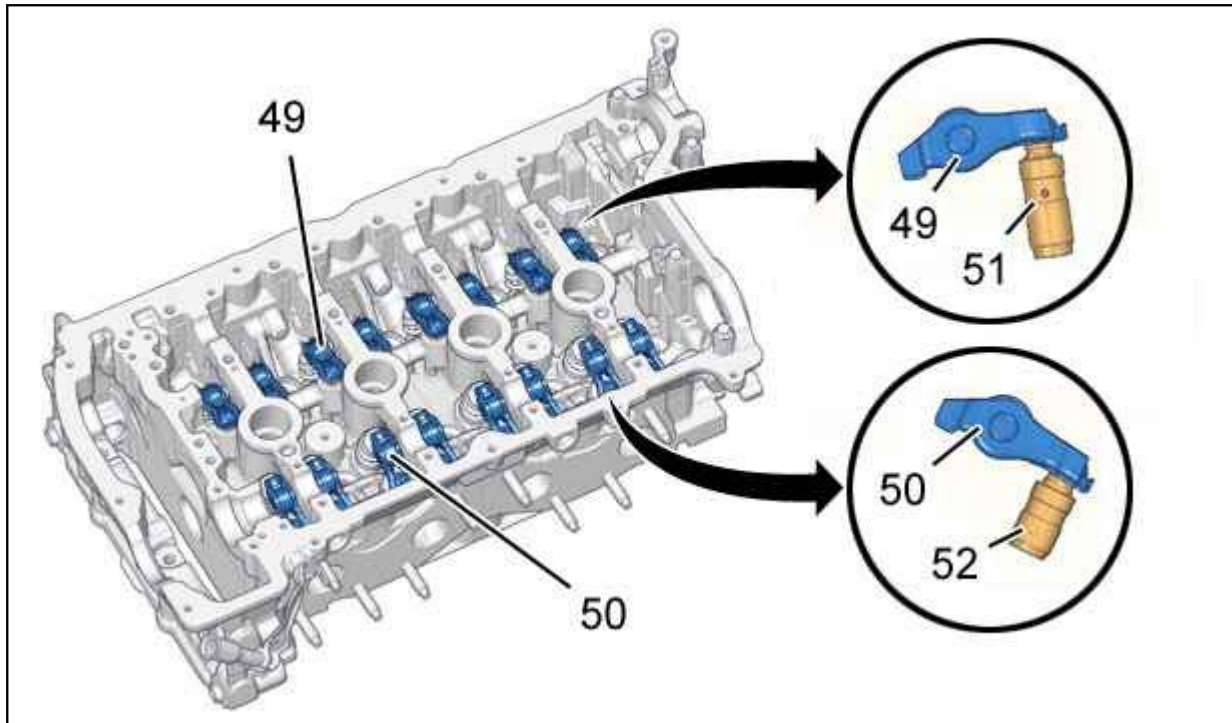


Figure : B1BG1RED

**CAUTION :** The inlet (51) and exhaust (52) hydraulic tappets differ in length.

Remove :

- The inlet rockers (49) fitted with the tappets (51)
- The exhaust rockers (50) fitted with the tappets (52)

Mark the position of each rocker/tappet assembly.

**N.B. :** Immerse the hydraulic tappets in oil to prevent depriming.

## 7. Removing the valves

### 7.1. Removing : Valve springs



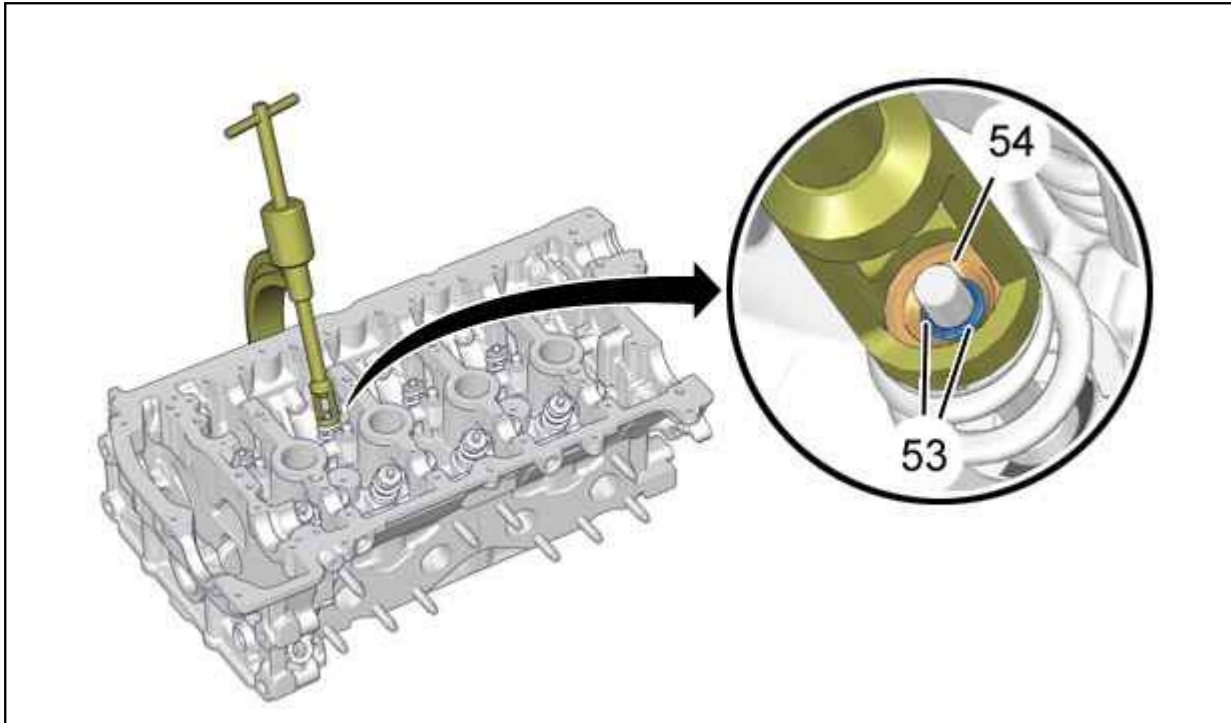


Figure : B1BG1RFD

**CAUTION :** Mark the location of the intake and outlet valves before removal.

Place the tool FACOM SP 18380 on the upper cup (54).  
Compress the valve springs ; Using tool FACOM SP 18380.  
Remove :

- The valve half-cones (53)
- The upper cup (54)



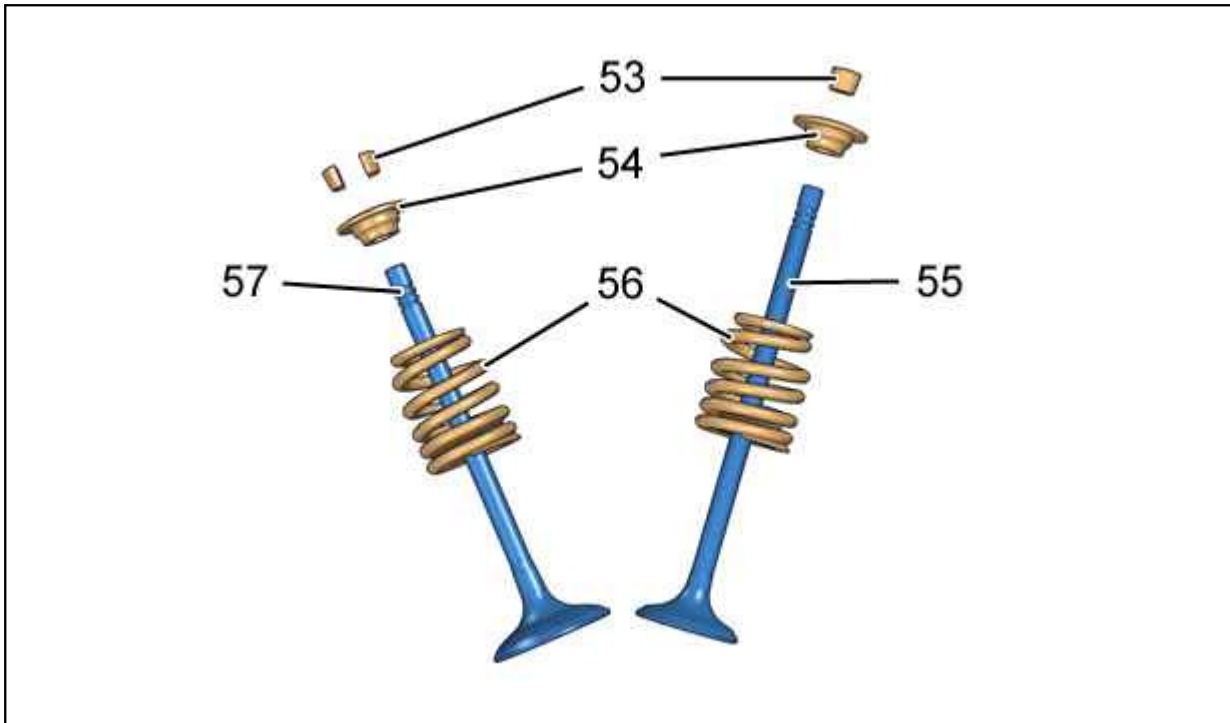


Figure : B1BG1RID

**N.B. :** Remove, valve by valve, the half-cones, upper cups, springs, valves; do not invert the components of each assembly.

Remove :

- The valve half-cones (53)
- The upper cups (54)
- The valve springs (56)
- The outlet valves (55)
- The intake valves (57)

## 7.2. Removing : Valve stem seals

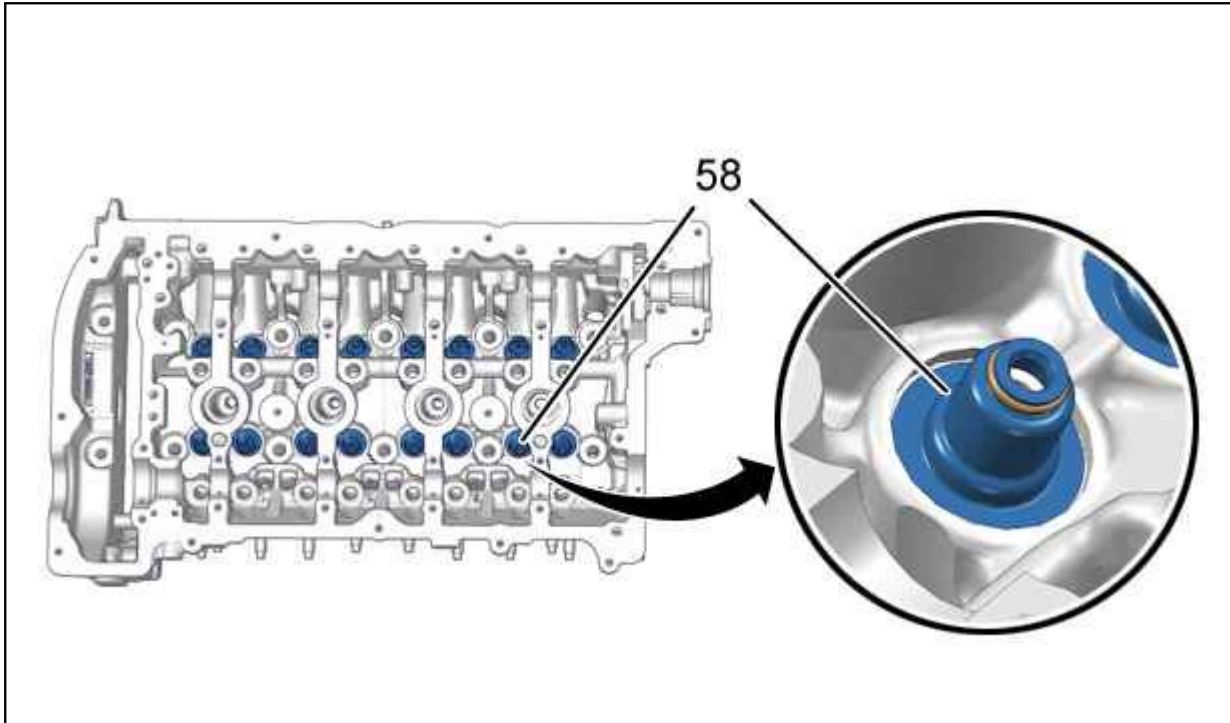


Figure : B1BG1RKD

Remove valve stem seals (58) ; Using tool [0170-A].