

## PRESENTATION : EP6 ENGINE

The EP6 engine is a petrol engine, naturally aspirated with indirect injection, equipped with a system of variable valve lift at inlet, the result of PSA/BMW collaboration.

### 1. Description



Figure : B1BM14LD

#### 1.1. Main structure of the EP6 engine

Petrol engine with indirect injection :

- 4 Cylinders in line with a displacement of 1,6 litres, 16 valves
- 2 overhead camshafts (Driven by the timing chain)
- 2 Variable dephasers (Driven by the inlet and exhaust camshafts)
- 1 Intermediate camshaft driven by an electric motor, for the variable valve lift
- Cylinder reference sensor
- Coolant pump (Driven by a friction wheel roller on the back of the accessories belt)
- vacuum pump (Driven by the exhaust camshaft)
- Upper cylinder head cover fitted with the oil separator and the oil filler hole
- Pressed steel sump

#### 1.2. Engraving on cylinder block

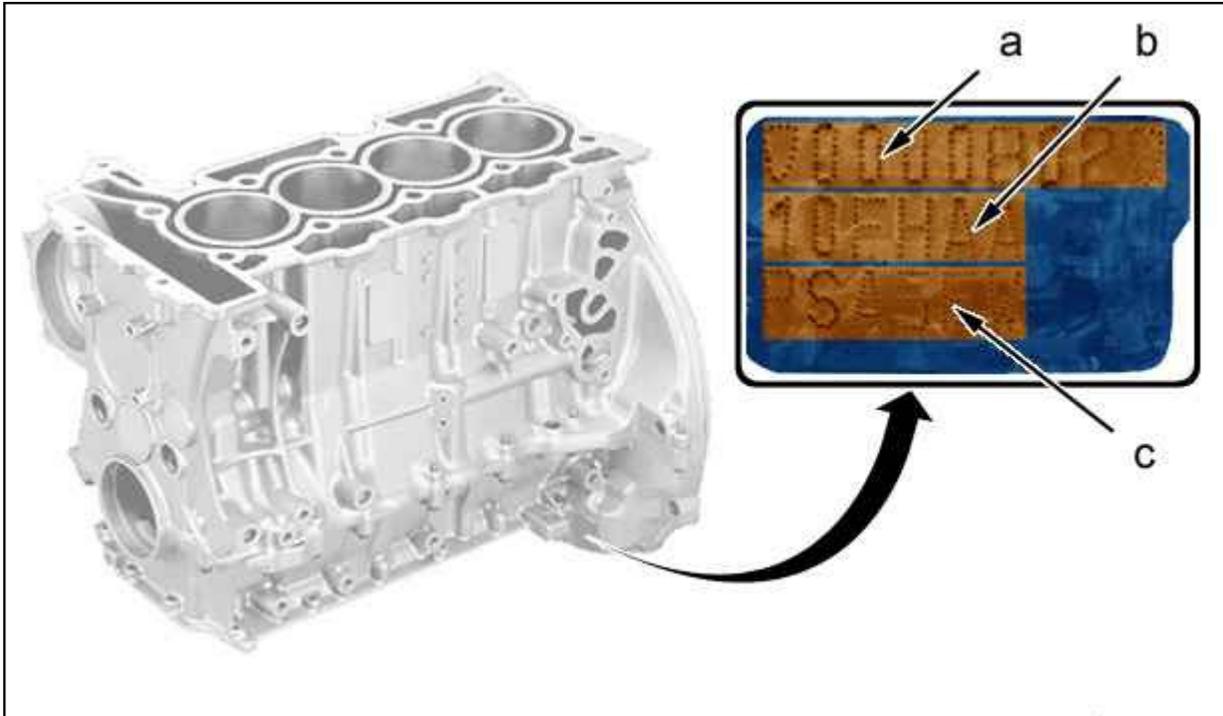


Figure : B1BM14MD

Engraving area comprising :

- "a" Serial number
- "b" The component reference
- "c" The legislation type

## 2. Data

<b>Engine code</b>	<b>EP6</b>
<b>Engine legislative type</b>	5FW
<b>Depollution norm</b>	EURO4
<b>Identification marking</b>	10FHAA
<b>Number of cylinders</b>	4
<b>Bore x stroke (mm)</b>	85,80x77
<b>Capacity (cc)</b>	1598
<b>Compression ratio</b>	11/1
<b>Maximum power (C.E.E)</b>	88kw
<b>Max. power (HP DIN)</b>	120CV
<b>Max. power speed</b>	6000 rpm
<b>Maximum torque (C.E.E)</b>	160 daNm
<b>Max. torque speed</b>	4250 rpm
<b>Injection system</b>	indirect injection - BOSCH - MEV 17.4
<b>Computer</b>	BOSCH
<b>catalytic converter</b>	Yes
<b>Particle filter</b>	No OK

### 3. Cylinder block

#### 3.1. Numbering of the cylinders

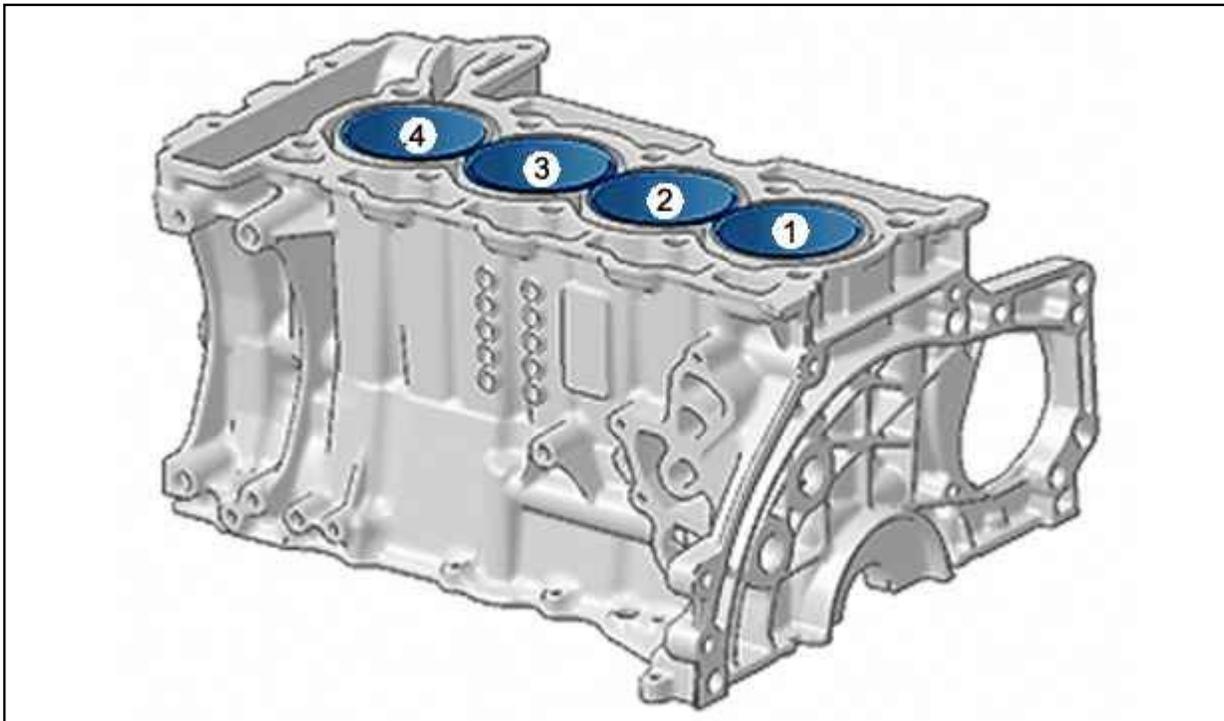


Figure : B1BM14ND

**CAUTION** : Cylinder n°1 is clutch end.

#### 3.2. Description

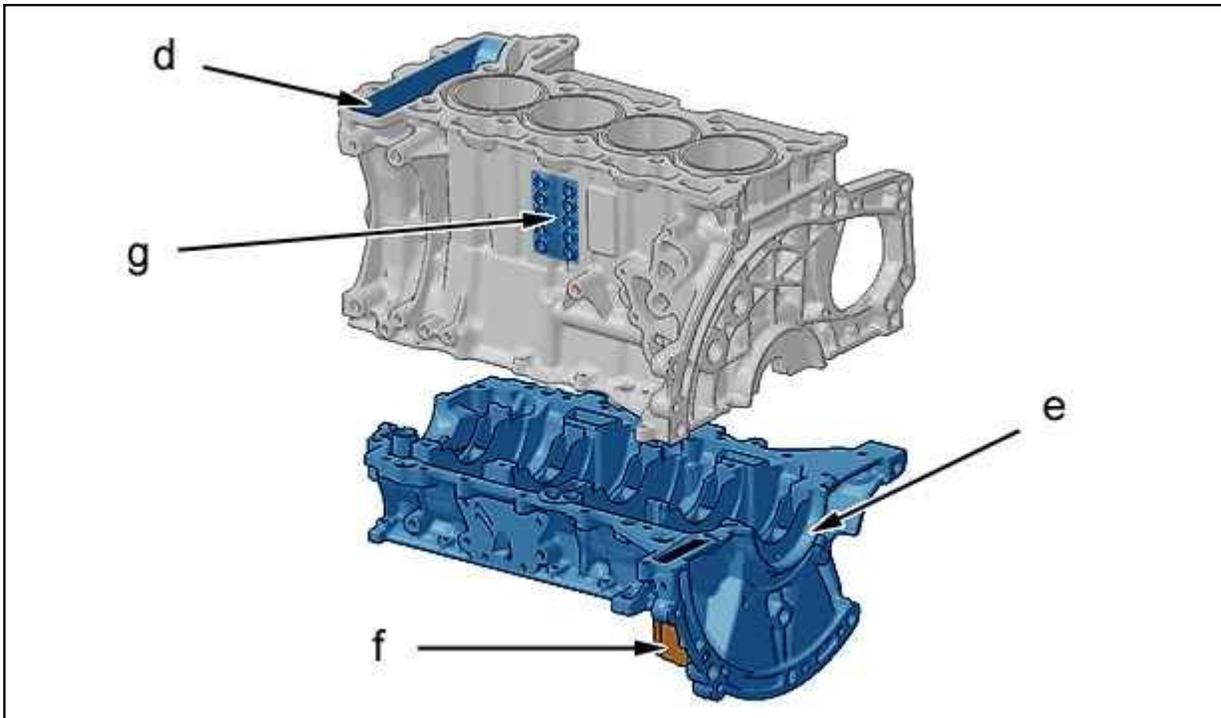


Figure : B1BM14PD

"d" Timing chain passage.

"e" Crankshaft main bearing cap casing.

"f" Engine identification engraving area.

"g" Zone for marking the bore classes of each cylinder.

Aluminium block with liners pour-inserted.

The cylinder block has no piston skirt oil spray jets.

The number of bearings is 5.

#### 4. Reciprocating gear

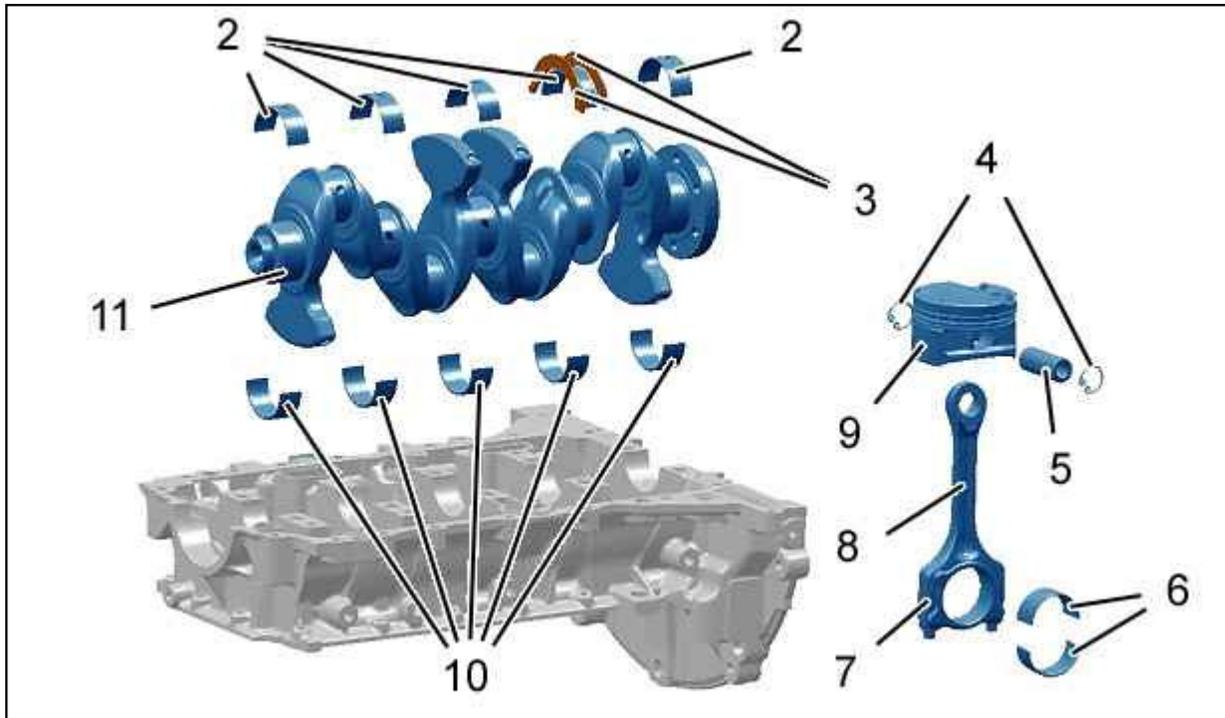


Figure : B1BM14QD

- (2) Grooved upper main bearing shell bearings.
- (3) Crankshaft stop thrust washers (Bearing n°2).
- (4) Gudgeon pin stop rings.
- (5) The piston shaft .
- (6) Big-end bearing shells.
- (7) Con rod marking zone.
- (8) Connecting rod.
- (9) Piston.
- (10) Smooth lower main bearing shell bearings.
- (11) Crankshaft .

#### 4.1. Crankshaft

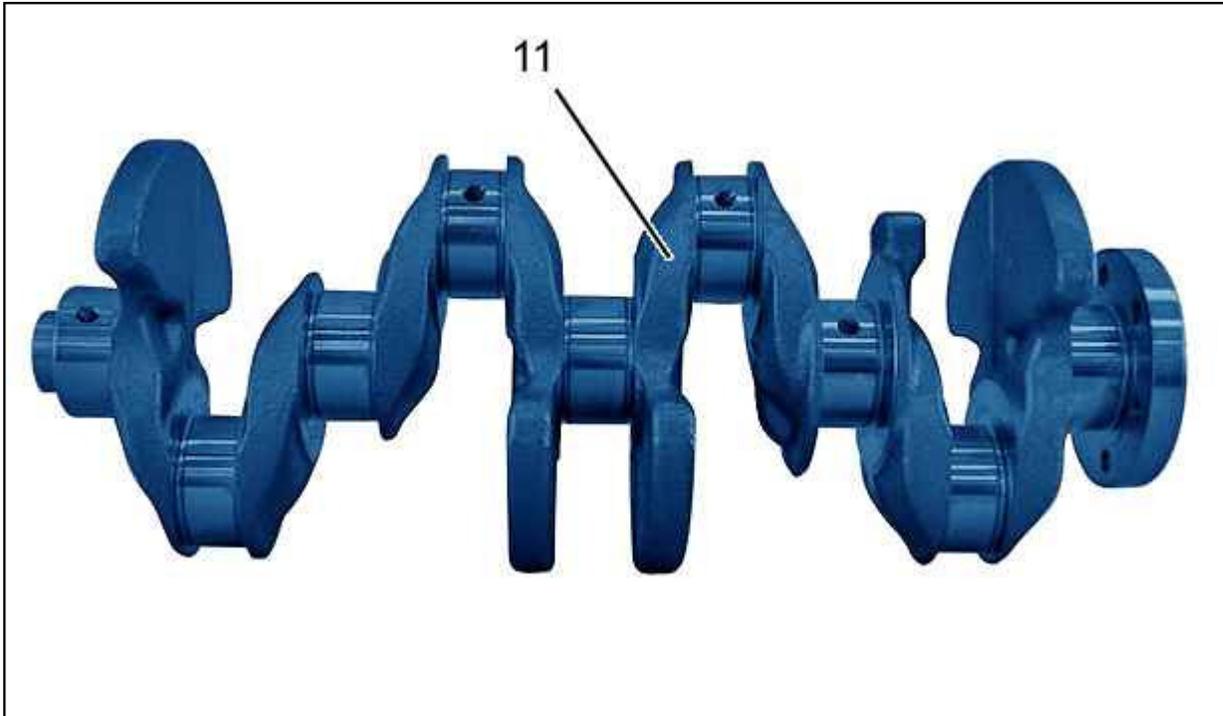


Figure : B1BM14RD

**(11) Crankshaft :**

- Material : Forged steel
- Amount of bearings : 5
- Only one balance weight
- The lateral clearance is adjusted by 2 shims on the upper bearing shell of main bearing No 2
- Diameter of the crankpins : 45 mm

**N.B. :** The main bearings are identified from 1 to 5, No 1 being on the clutch side.

**4.2. Crankshaft lower bearing shells**

There are 5 classes for the crankshaft lower bearing shells.  
The lower bearing shells are smooth.

**4.3. Crankshaft upper bearing shells**

There are 5 classes for the crankshaft upper bearing shells.  
The upper shell bearings are grooved and have a lubrication hole.

**4.4. Conrods**

There is only class of connecting rod :

- The conrods are of the "cleavable" or "split" type
- The little end is of "adder's head" shape and fitted with a steel bush; the gudgeon pin is free in the bush
- The big end half shells are smooth
- Diameter of con rod big ends 45 mm
- Con rod axes 139,29 mm

**4.5. pistons - Piston rings**

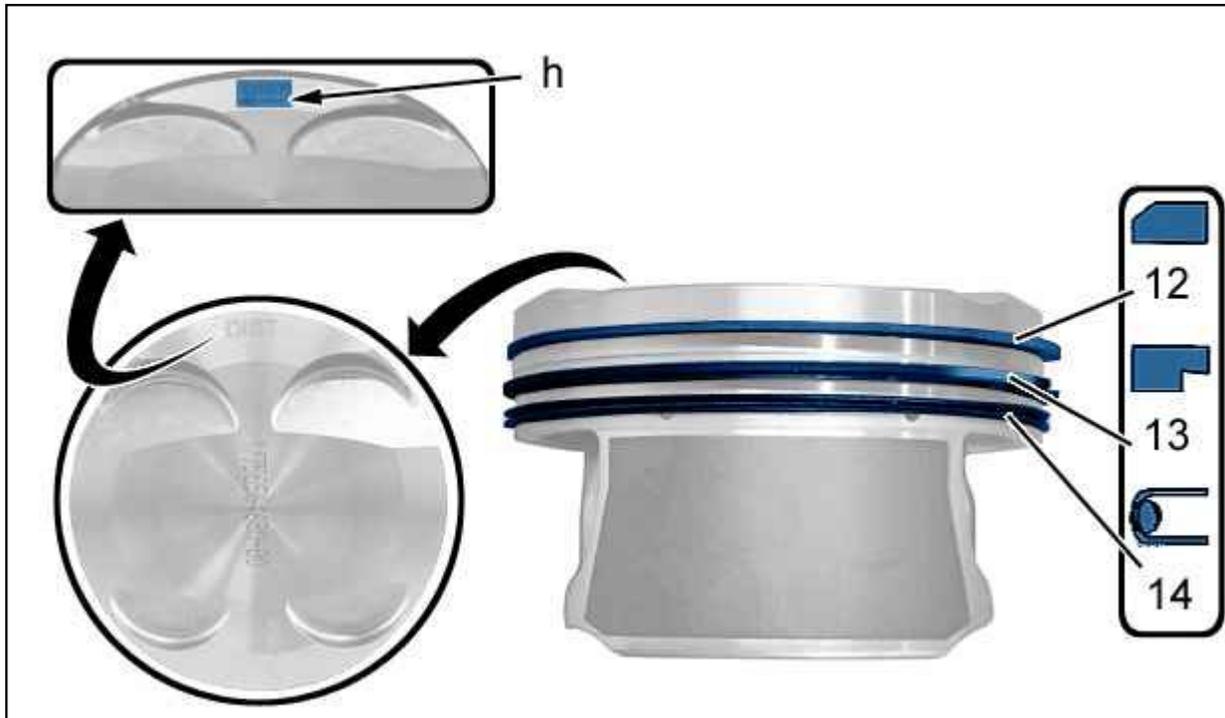


Figure : B1BM14SD

"h" Arrow pointing to timing end.

(12) Upper seal ring : Compression ring.

(13) Centre compression ring.

(14) Scraper ring with spiroid spring .

The gudgeon pins are immobilised in translatory motion by two stop rings.

#### 4.6. Engine flywheel

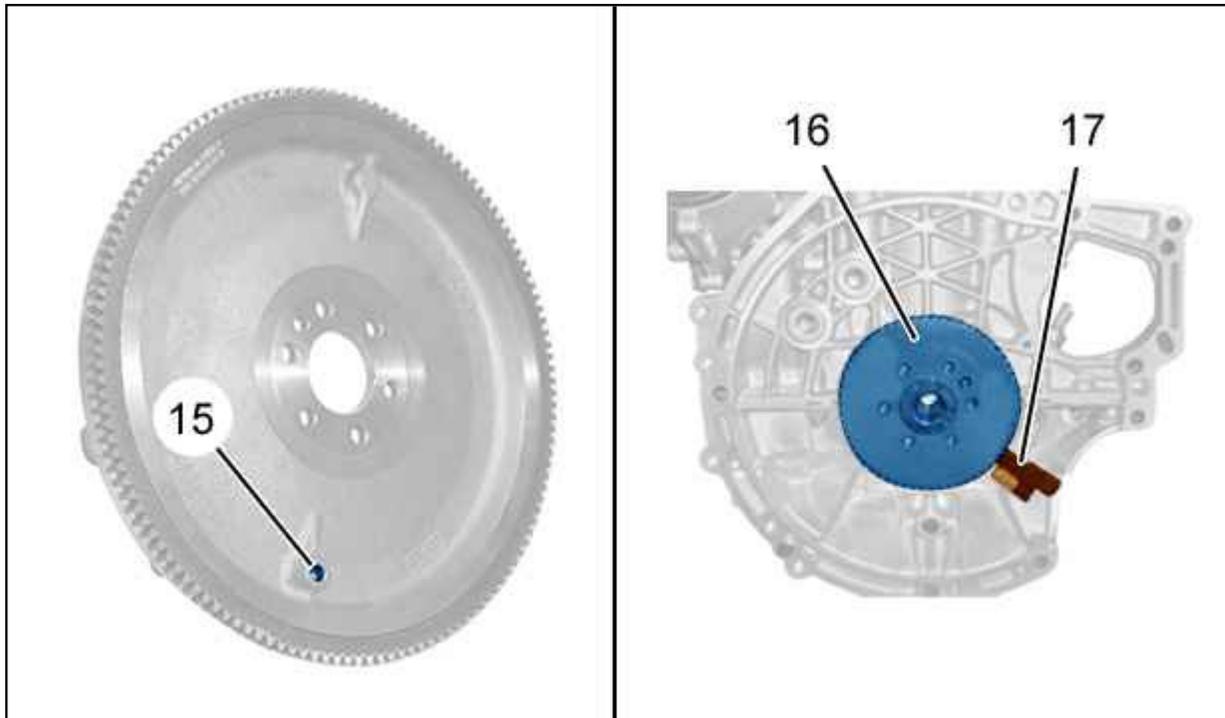


Figure : B1BM14TD

Single flywheel :

- (15) Setting hole
- (16) Engine speed sensor target
- (17) Engine speed sensor

The engine speed target is fitted behind the flywheel.

The engine speed target is a toothed wheel from which some teeth have been removed to determine the top dead centre of the engine.

#### 4.7. Accessories drive pulley

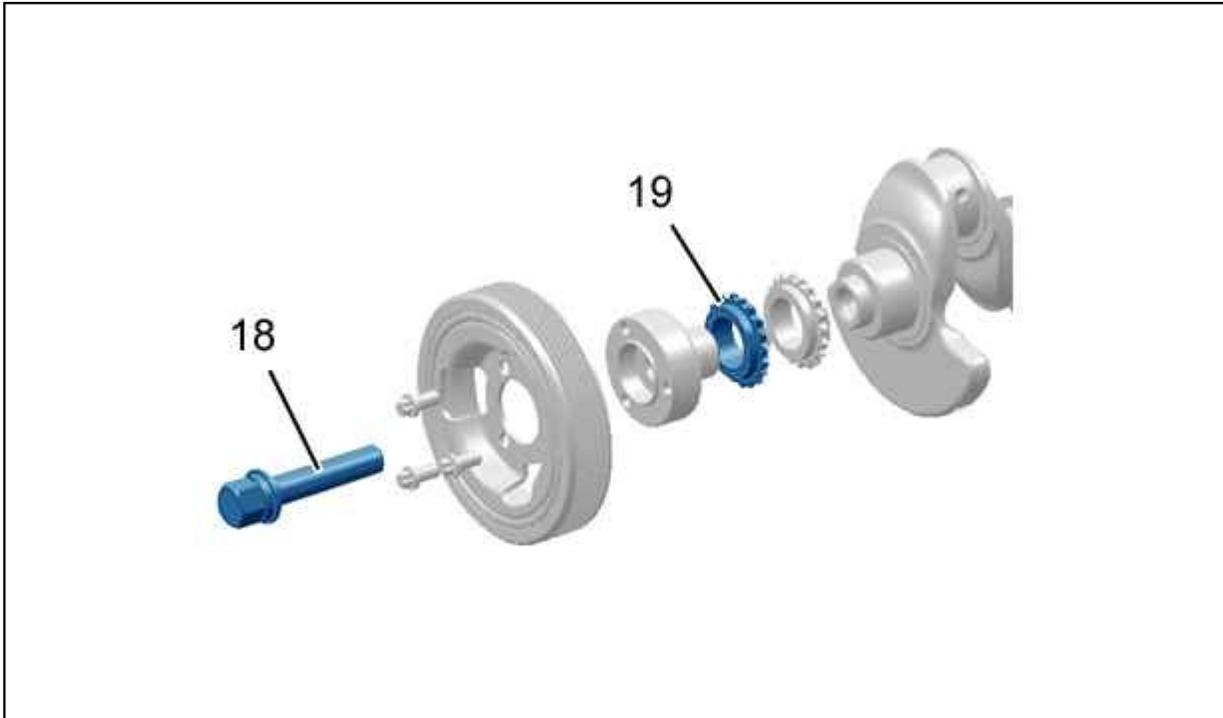


Figure : B1BM14UD

**URGENT** : Immobilise the engine before slackening the central screw fixing the crankshaft pinion (18).

Accessories drive pulley with single vibration and torsion damper :

- Mounted on the crankshaft by means of 3 bolts on the crankshaft hub
- Timing pinion (19) "pinched" type without keyway on crankshaft

## 5. Cylinder head assembly

### 5.1. Upper cylinder head cover (With incorporated oil separator)

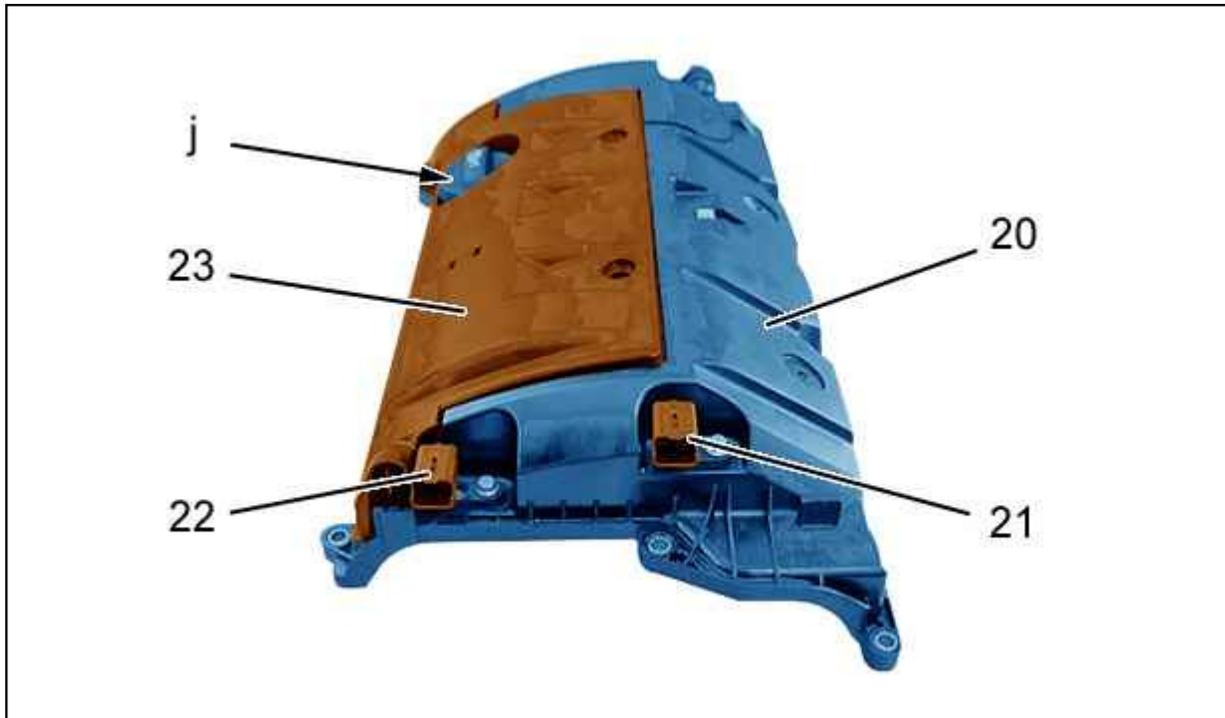


Figure : B1DM0B7D

- (20) Integrated oil separator .
- (21) Inlet camshaft position sensor.
- (22) Exhaust camshaft position sensor.
- (23) Cover for coils and sparking plugs.
- "j" Oil filler orifice.

The cylinder head cover and spark plug opening seals are preformed and removable.

## 5.2. Cylinder head

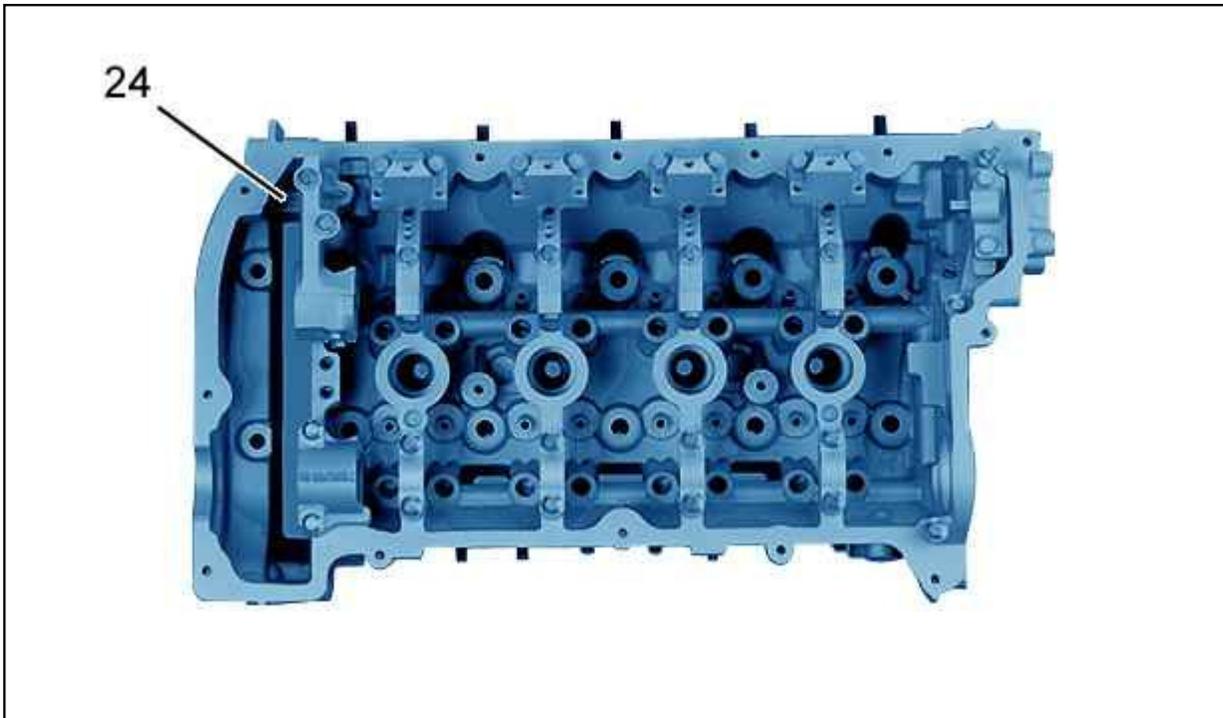


Figure : B1DM0B8D

(24) Cylinder head made of light alloy :

- 4 valves per cylinder (2 inlet, 2 exhaust) with clearance adjustment by hydraulic tappets
- The inlet ducts are located in the rear of the engine
- The exhaust ducts are located on the front face of the engine

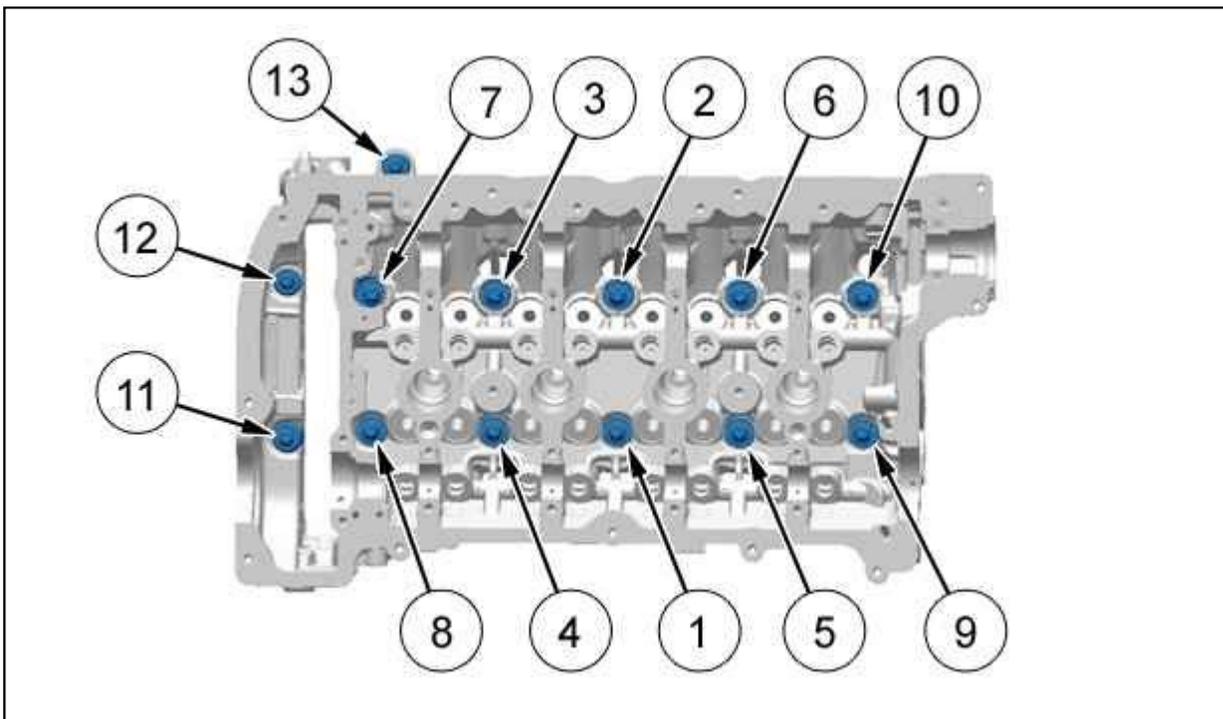


Figure : B1DM0B9D

**CAUTION :** Follow the tightening sequence (In the order from 1 to 13).

Tightening procedure :

- Pre-tighten the bolts (In the order from 1 to 10) ; to  $3 \pm 0,2$  daN.m
- Pre-tighten the bolts (In the order from 11 to 12) ; To  $2,5 \pm 0,2$  daNm
- Pre-tighten the screw (13) to  $1,5 \pm 0,2$  m.daN
- Angular tighten the screws to  $90 \pm 3^\circ$  (In the order from 1 to 10)
- Angular-tighten the screws (13) to  $90 \pm 3^\circ$
- Tighten the screws (11 to 12) to 3 m.daN

### 5.3. Camshafts



Figure : B1DM0BDD

(25) Intermediate camshaft (Variable valve lift control).

(26) Induction camshaft.

(27) Exhaust camshaft.

The camshafts are of composite type.

The camshafts each comprise 8 forged steel cams and 5 bearings.

The inlet and exhaust camshafts are driven by the timing chain.

The drive sprockets are fixed to the camshafts by 3 bolts.

The exhaust camshaft operates the following components :

- The vacuum pump (Flywheel side)
- The valves via the roller valve rockers
- The exhaust dephaser (Timing gear side)

The inlet camshaft operates the following components :

- The valves via the roller valve rockers
- The inlet dephaser (Timing gear side)
- The intermediate camshaft acts on the following elements
- The variable valve lift control system
- The variable valve position sensor

The hydraulic tappets take up the wear by maintaining zero clearance between the camshaft, the roller valve rockers and the valves.

Lubrication is via a longitudinal channel.

Lateral passages direct the oil to the cams and camshaft bearings.

#### 5.4. Cylinder head gasket

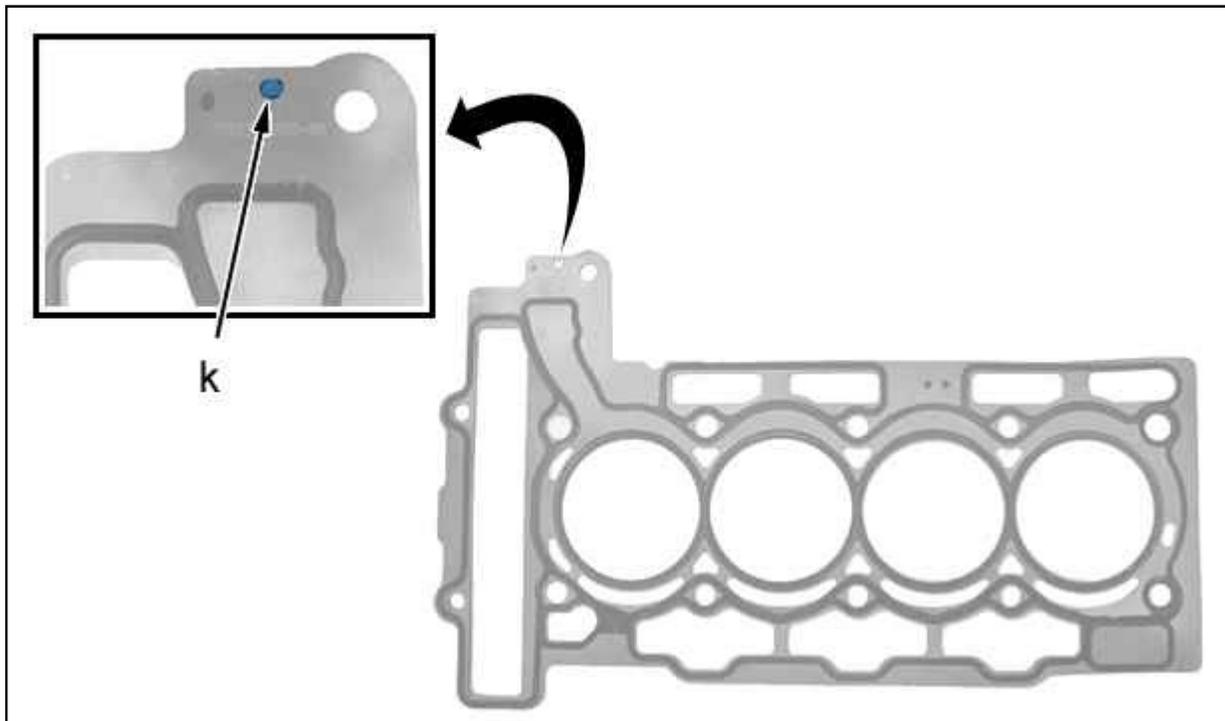


Figure : B1DM0BAD

"k" : Engine identification :

- 1 hole : Non-turbocharged engines
- 2 holes : Turbocharged engines

Number of categories : 1.

Type : Laminated metallic cylinder head gasket.

#### 5.5. Hydraulic cam followers and valve rockers

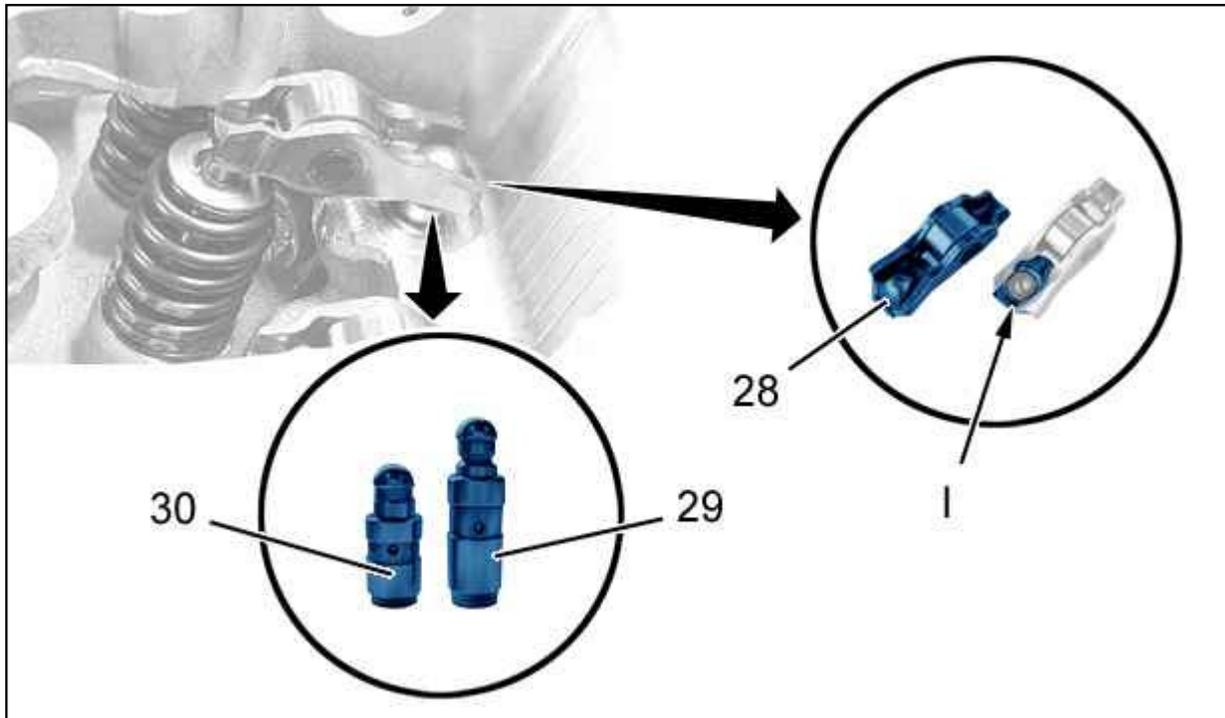


Figure : B1DM0BED

(28) Roller cam follower.

(29) Hydraulic inlet tappet.

(30) Hydraulic exhaust tappet.

The hydraulic tappets automatically adjust valve clearance.

The roller valve rockers are held on the tappets by a clip "1".

There are 5 classes of valve rockers.

### 5.6. valves

Inlet valve :  $\varnothing$  30 mm.

Exhaust valve :  $\varnothing$  25 mm.

Valve stem :  $\varnothing$  5 mm.

Length of the exhaust valve : 11,1 mm .

Length of the inlet valve : 9,7 mm .

### 5.7. Valve springs

Number of coils : 7,4.

Free height : 42 mm .

### 5.8. Variable valve lift

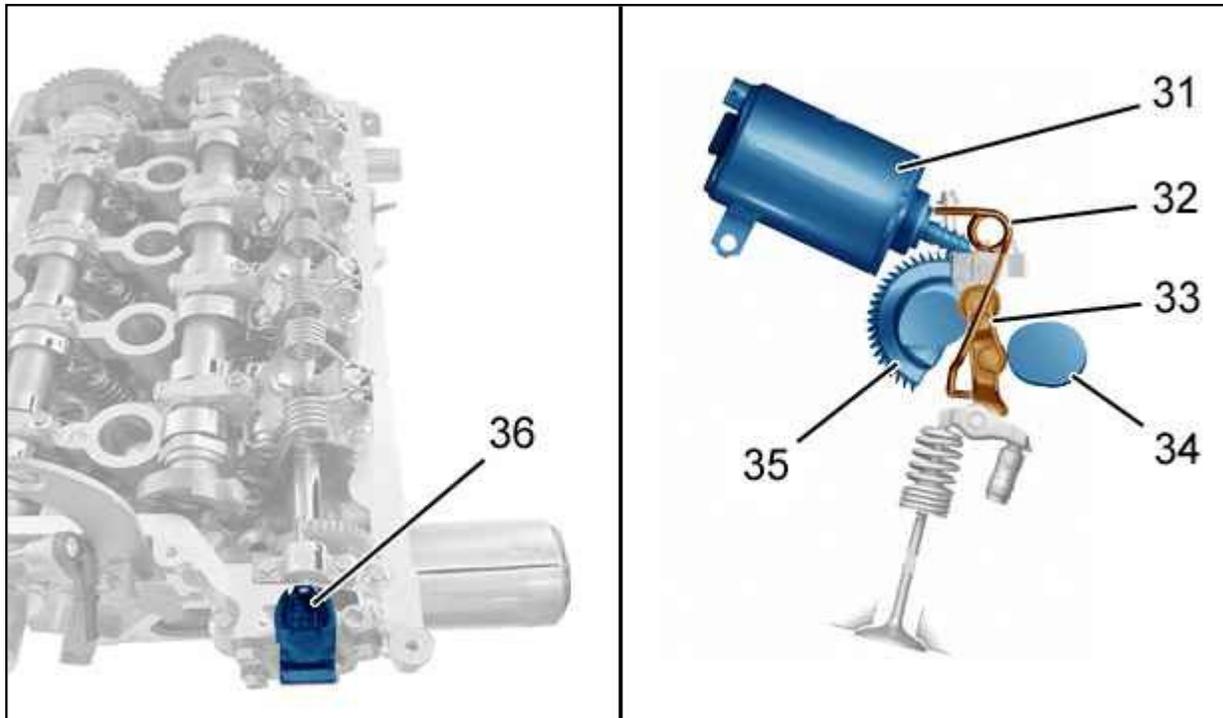


Figure : B1DM0BB D

System of variable valve lift at inlet :

- Management of the opening of the inlet valves by the engine ECU
- Optimisation of the filling of the cylinders over a big engine speed range
- Reduction in fuel consumption at idle and at light load

Composition of the system of variable valve lift at inlet :

- (31) Electric motor
- (32) Recoil springs
- (33) Intermediate levers
- (34) Inlet camshaft
- (35) Intermediate shaft
- (36) Variable valve position sensor

There are 2 classes of intermediate levers, to permit compensation of machining tolerances.

### 5.9. Valve lift operation

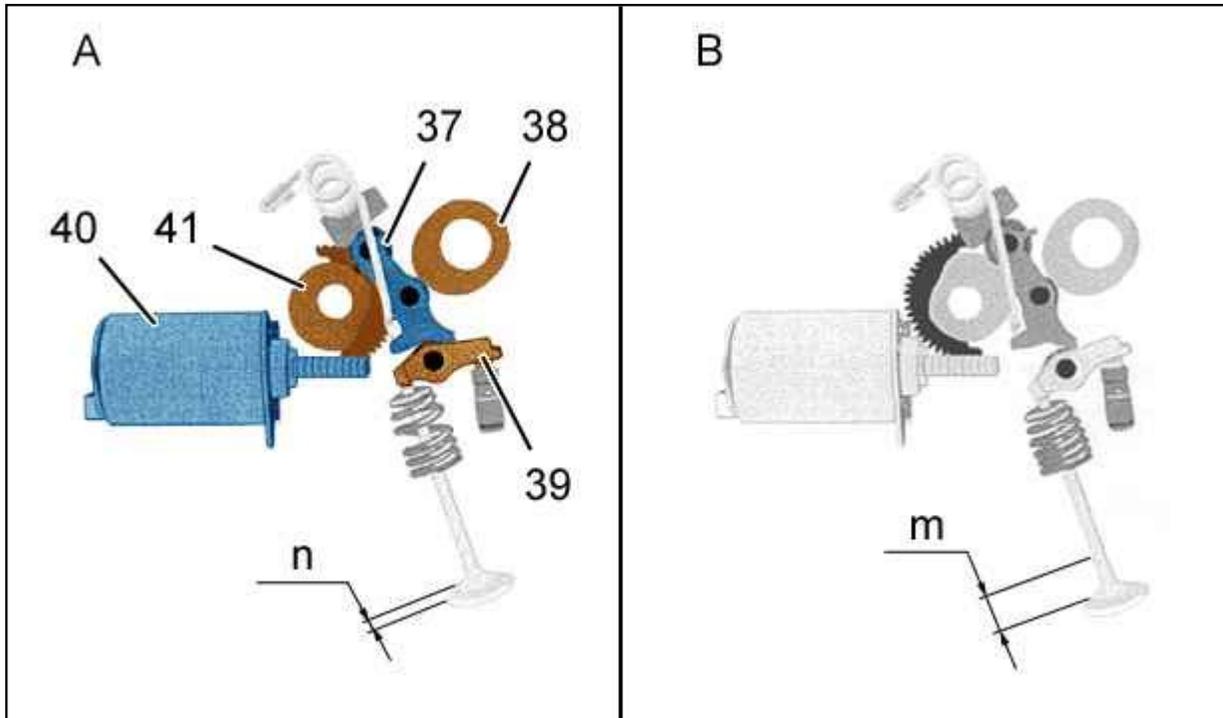


Figure : B1DM0BCD

"A" Light load = Maximum opening with low power need :

- The lever (37) is distanced from the cam (38) by the action of the electric motor (40) on the toothed ring of the intermediate shaft (41)
- The lever follows only a part of the movement of the cam
- The time of opening of the valve is shortened and its displacement can be as little as 0,3 mm

"B" Heavy load = Maximum opening with maximum power need :

- The lever (37) is placed between the camshaft (38) and the roller valve rocker under heavy load (39)
- The lever (37) has permanent contact with the cam
- The fall of the valve is 9,5 mm (m)
- The valve is opened to the maximum

**N.B. :** The inlet valve lift values are between "n" 0,3 mm and "m" 9,5 mm.

## 6. Timing gear

### 6.1. Data

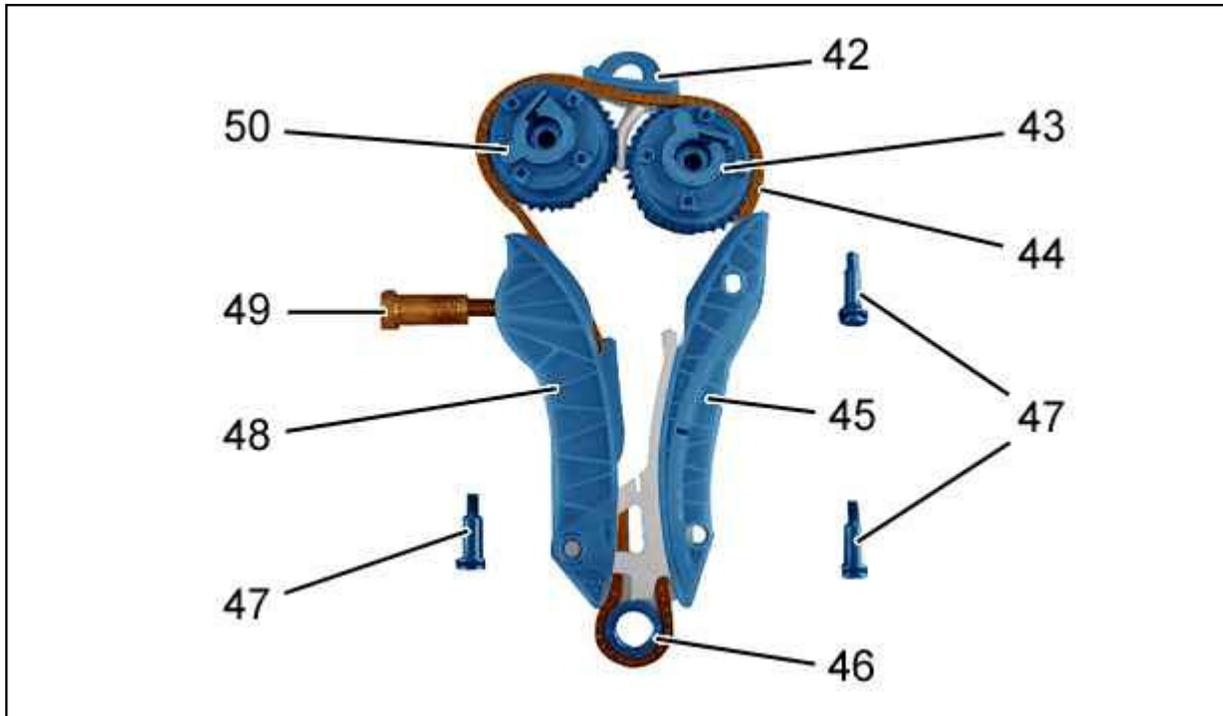


Figure : B1EM09VD

- (42) Upper timing chain guide .
  - (43) Exhaust camshaft dephaser.
  - (44) Drive chain.
  - (45) Fixed timing chain guide.
  - (46) Timing gear.
  - (47) Chain guide fixings.
  - (48) Mobile chain guide.
  - (49) Hydraulic chain tensioner.
  - (50) Inlet camshaft dephaser .
- The oil pump is driven by means of a chain.

## 6.2. Hydraulic chain tensioner

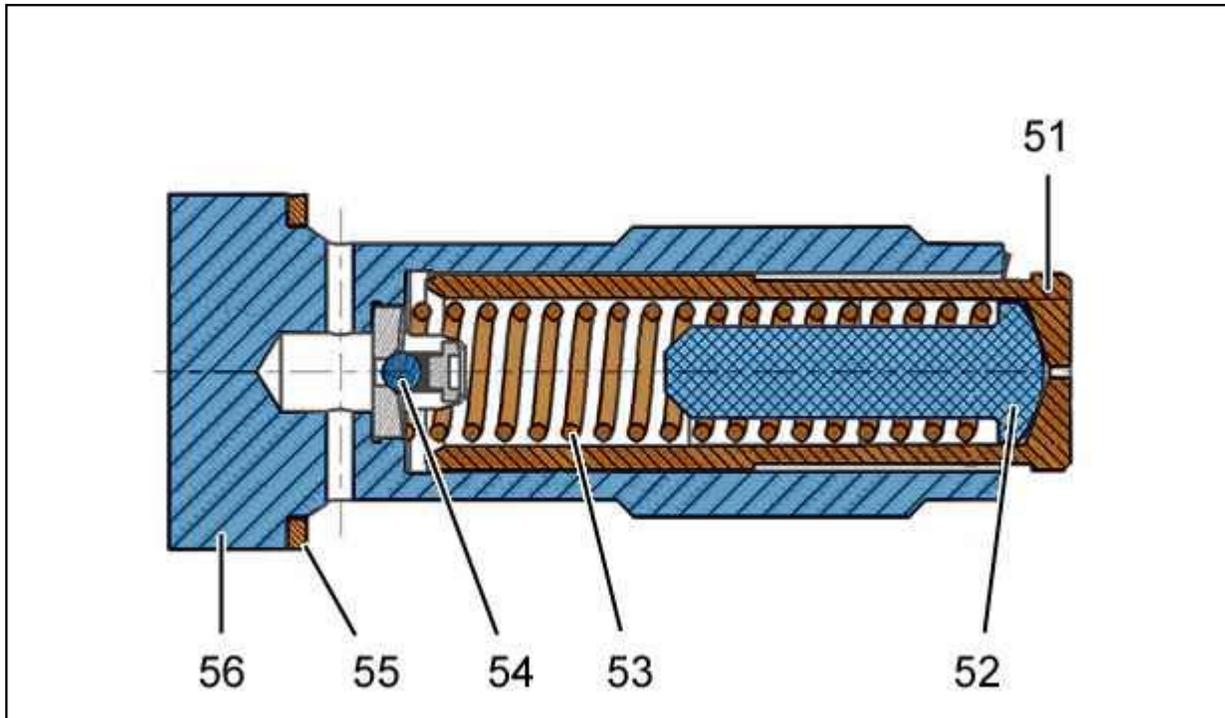


Figure : B1EM09WD

- (51) Piston.
- (52) spacer .
- (53) spring .
- (54) Non-return valve.
- (55) The seal .
- (56) Casing.

Starting the engine/ engine running :

- The oil pressure increases in the lower chamber until the valve opens
- The oil fills the upper chamber
- The piston applies a tension onto the drive chain

When the engine is switched off :

- When the oil pressure in the lower chamber drops the valve is closed by the spring
- The upper chamber is isolated, preventing the oil from escaping
- The piston keeps tension on the drive chain for the next time the engine is started