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## CHECKING AND ADJUSTING VALUES : DT20 ENGINE TYPE

### 1. Foreword

#### 1.1. Units of pressure

1/ Units of pressure in bars.

**N.B. :** One bar has the advantage of being close to the average atmospheric pressure at sea level.

2/ Unit of pressure in millimetres of mercury (symbol: mmHg) or Torr (symbol: Torr).

This unit of measurement of pressure was originally defined as the pressure exerted at 0°C by a 1 millimetre column of mercury, later indexed to the atmospheric pressure.

The pressure values indicated in the tables below are the values read on the pressure gauge (Relative pressure).

**N.B. :** Relative pressure is equal to absolute pressure minus atmospheric pressure.

#### 1.2. Units of tension

The SEEM unit measures by deflection of the static tension of the belt, by deforming a portion of its length.

### 2. General engine information

Engine type	DT20C
Engine legislation type	X8C
Cubic capacity	2992 cc
Fuel	ES RON 95
Maximum power	177 kW
Engine speed at maximum power	3800 rpm
Maximum torque	45 daNm
Engine speed at maximum torque	1600 rpm

### 3. Oil capacity

Designation	By gravity	By suction
Oil capacity without replacement of the filter cartridge	6,1 litres	6,35 litres
Oil capacity with replacement of the filter cartridge	6,25 litres	6,5 litres
Capacity between minimum and maximum on the oil gauge	1,75 litre	

Oil change interval : Refer to the maintenance schedule.

**CAUTION :** Check the oil level systematically using the manual oil dipstick.

### 4. Oil pressure

**N.B. :** Check the oil level with the engine cold.

**CAUTION :** Oil pressure is checked with the engine hot after checking the oil level (80 °C).

Engine speed	Minimum oil pressure
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750 rpm	1,2 bar
1500 rpm	1,8 bar
2000 rpm	2,2 bars
3000 rpm	2,6 bars

### . Ancillary drive belt

Belt tension	By dynamic roller tensioner
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### . timing belt

Belt tension	By dynamic roller tensioner
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### . Cylinder head bolts

**CAUTION** : Replace the cylinder head bolts systematically.

### . Pressure engine end of compression

Measure the pressure at the end of compression, in order, on cylinders 1, 2 ,3 and 4.

**N.B.** : The difference in pressure between 2 cylinders must not be greater than 5 bars.

**CAUTION** : Always search for the origins of fault(s), where the values measured are found to be significantly out.

### . Boost pressure

Engine speed	Turbocharger pressure
750 rpm	0 bar
1500 rpm	0,1 bar
2000 rpm	0,2 bar
3000 rpm	0,4 bar
Sudden foot to the floor	1 bar

**N.B.** : If the turbo pressure is below the reference values, refer to the turbo pressure checking method.

## 10. Vacuum circuit

The vacuum provided by the vacuum pump should be 0,85 bar at idle.

The vacuum at the EGR control electrovalve supply pipe should be 0.30 bar at idle.

Checking the movement of the front and rear electric EGR valve flaps :

- The start of movement of the electric EGR valve flap should be under 0,2 bar of vacuum
- The end of movement of the electric EGR valve flap should be under 0,3 bar of vacuum

## 11. Low pressure fuel supply circuit

The low-pressure fuel circuit is fitted with a fuel pump and a fuel pressure regulator.

The fuel pressure regulator authorises a maximum pressure in the fuel circuit of 0,7 bar.

Switch on the ignition.

Fuel supply pressure indicated by the pressure gauge 0,6 bar.  
Start the engine.

**N.B.** : On starting the engine the pressure value indicated by the pressure gauge is equal to 0.5 bar.

	Normal operation	
Engine speed	Fuel feed pressure	Fuel return pressure
Idling	0,5 bar	0,2 bar
Fast idle speed (3000 rpm)	0,5 bar	0,2 bar

If the fuel delivery pressure is below the reference value, check the tank scavenge pump, the fuel filter and also the supply piping.

If the fuel return pressure is above 0,4 bar, check the fuel return circuit.

**DT20C ENGINE**

**JLR 3.0L 24V DOHC V6 TC Diesel**

**MATCHING BEARING SHEELS**

## Markings on the cylinder block and Crankshaft enable matching.

### 1. Identification

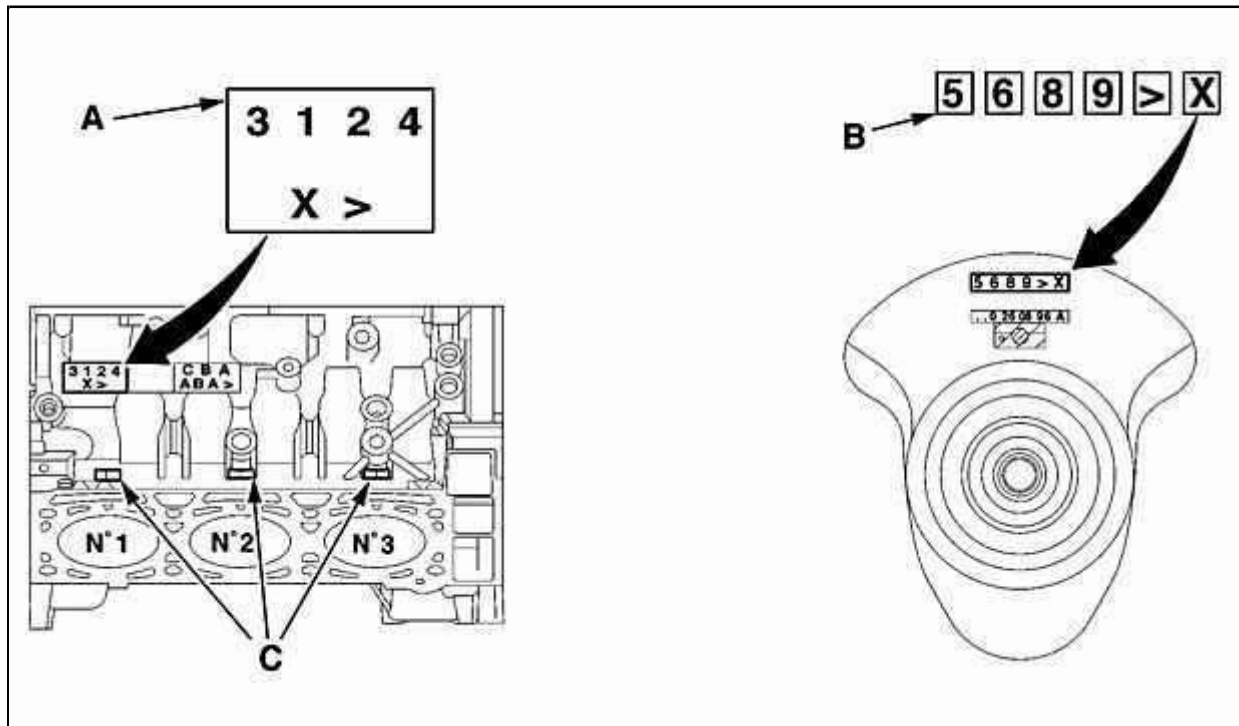


Figure : B1CK14JD

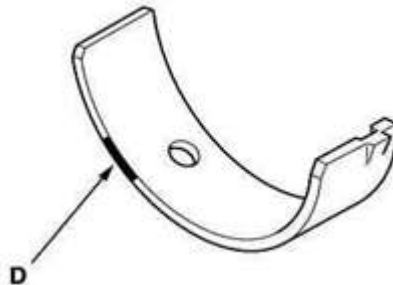
The categories of bearing shells are given on the engine block ( A ), flywheel side, and on the crankshaft ( B ), timing side, in the form of codes.

Zone(s) ( A ) - ( B ) :

- ☐ The first character corresponds to bearing no 1, the second to bearing no 2 and so on
- ☐ The arrow indicates the timing side

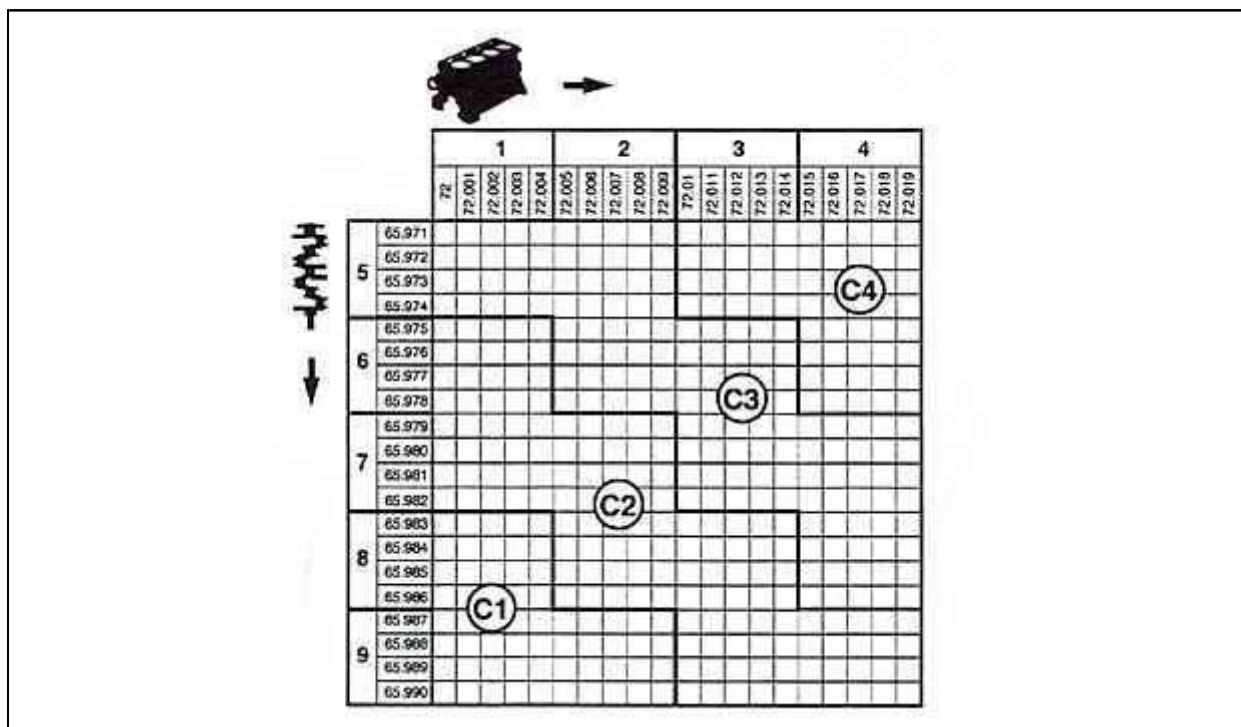
Zone ( C ) : Numerical marks of the corresponding cylinder.

## 2. Identification (Half shells)



A paint mark at (D) identifies the grade.

## 3 . Matching table



The diagram shows a crankshaft and a cylinder block with an arrow pointing to a matching table. The table is a grid with 9 rows and 4 columns. The rows are labeled 5 through 9 on the left, and the columns are labeled 1 through 4 at the top. The grid contains various alphanumeric codes. A crankshaft icon is shown above the grid, and a cylinder block icon is shown to the left of the grid. A vertical arrow points downwards on the left side of the grid.

		1	2	3	4
	72	72.001	72.002	72.003	72.004
		72.005	72.006	72.007	72.008
		72.009	72.010	72.011	72.012
		72.013	72.014	72.015	72.016
		72.017	72.018	72.019	72.020
5	65.971				
	65.972				
	65.973				C4
	65.974				
	65.975				
6	65.976				
	65.977			C3	
	65.978				
	65.979				
7	65.980				
	65.981		C2		
	65.982				
8	65.983				
	65.984				
	65.985				
	65.986	C1			
9	65.987				
	65.988				
	65.989				
	65.990				

Figure : B1CG000D

If the first number of the crankshaft is (5) and that of the cylinder block is (3) : The half shell on the main bearing cap no. 1 side will be of grade C4.

Dimensions ( mm )	Nominal	Nominal	Nominal	Nominal
Half shells (Reference )	class C1 (Black )	class C2 (Blue )	class C3 ( yellow)	class C4 (Red )
G	2,987 + 0,006 - 0	2,995 + 0,006 - 0	3,003 + 0,006 - 0	3,011 + 0,006 - 0

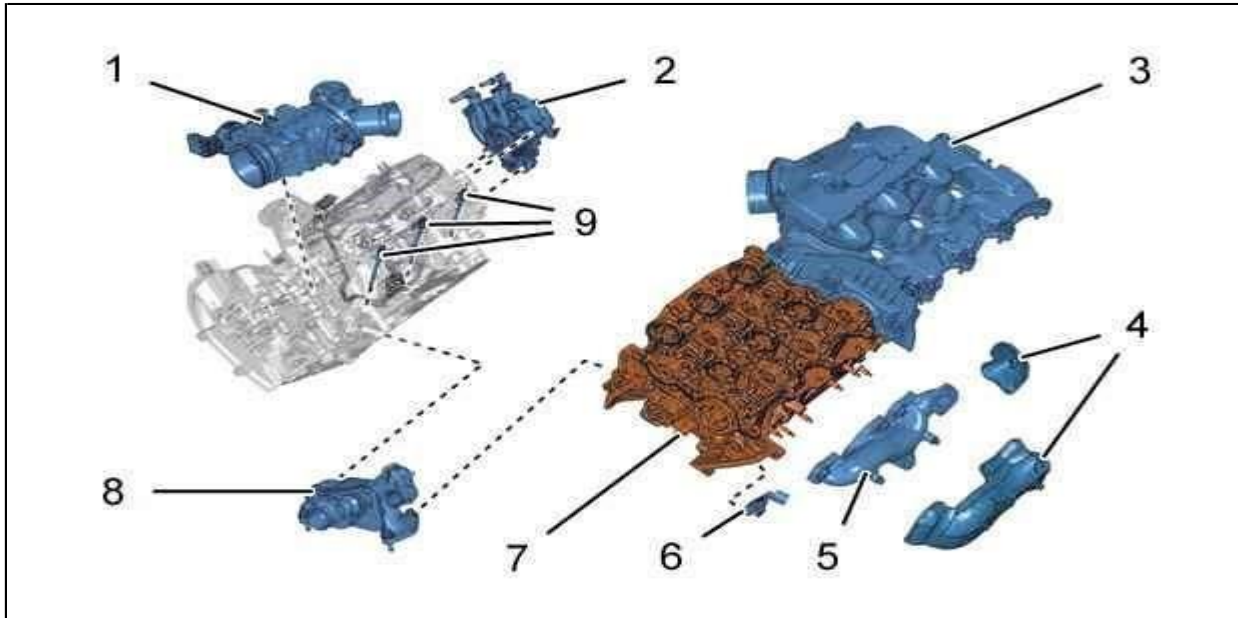
**(DT20C ENGINE)**  
**JLR 3.0L 24V DOHC V6 TC Diesel**

# **TYPE TIGHTENING TORQUES**



# 1. Cylinder head

CAUTION : (\*) Follow the tightening sequence.



Reference	Designation	Tightening procedure
(1)	bolts - Throttle butterfly housing	Tightening torque to <b>9 Nm</b>
(2)	bolts - vacuum pump	Tightening torque to <b>23 Nm</b>
(3)	Inlet valve cover screws (*)	Tightening torque to <b>9 Nm</b>
	Inlet valve cover studs (*)	
(4)	bolts - Exhaust manifold heat shields	Tightening torque to <b>10 Nm</b>
(5)	studs - Exhaust manifolds	Tightening torque to <b>13 Nm</b>
	nuts - Exhaust manifolds (*)	Tightening torque to <b>28 Nm</b>
(6)	bolts - Cylinder reference sensor	Tightening torque to <b>9 Nm</b>
(7)	studs - Exhaust manifolds	Tightening torque to <b>13 Nm</b>
	Cylinder head bolts (*)	Pre-tighten to <b>20 Nm</b>
		Tightening torque to <b>40 Nm</b>
		Tightening torque to <b>80 Nm</b>
	Angular tightening to <b>180°</b>	
(8)	Coolant outlet housing	Tightening torque to <b>9 Nm</b>
(9)	Pre-heater plugs	Tightening torque to <b>10 Nm</b>

### 1.1. Order of tightening : bolts - studs (3)

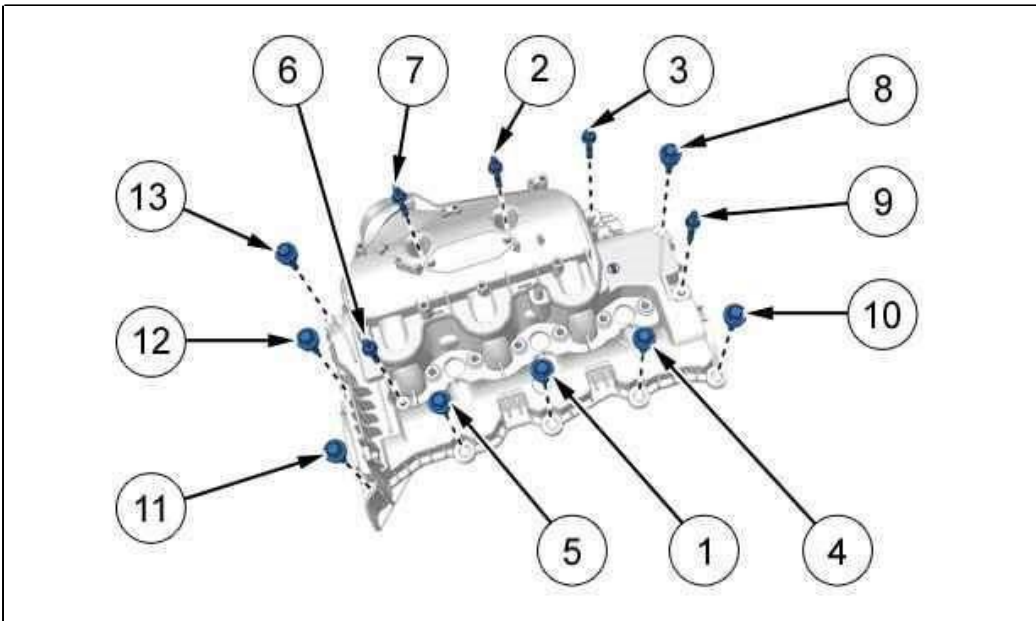
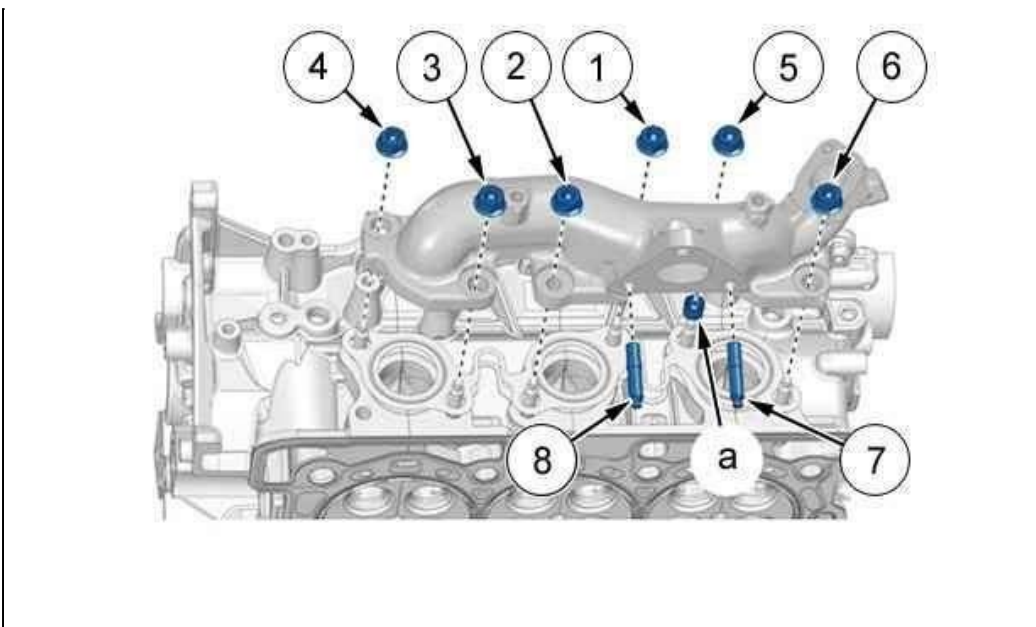


Figure : B1JB08HD

(3) Inlet valve cover screws.

(3) Inlet valve cover studs.

### 1.2. Order of tightening : nuts - studs (5)



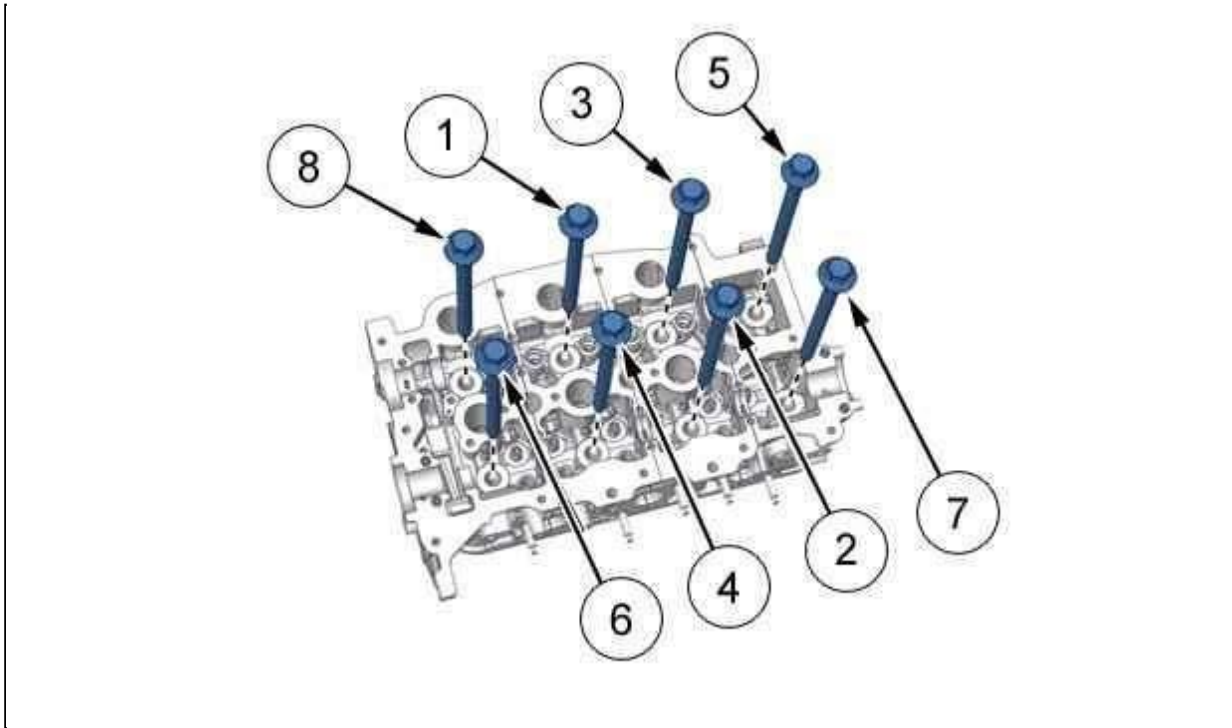
(5) Exhaust manifold nuts.

(5) Exhaust manifold studs.

Tightening procedure : Exhaust manifold nuts :

1. Offer the exhaust manifold up to the cylinder head with the centering device "a"
2. Tighten the 6 nuts (5) to **28 Nm** (From 1 to 6)  
Tighten the 2 studs (5) to **13 Nm** (From 7 to 8)

### 1.3. Sequence of tightening the bolts (7)



Tightening procedure : Cylinder head bolts :

1. Pre-tighten the 8 bolts (7) to **20 Nm** (From 1 to 8 )
2. Tighten the 8 screws (7) to **40 Nm** (From 1 to 8 )
3. Tighten the 8 screws (7) to **80 Nm** (From 1 to 8 )
4. Angle tighten the 8 bolts (7) to 180° (From 1 to 8 )

## 2. EGR (exhaust gas recycling) electro valve

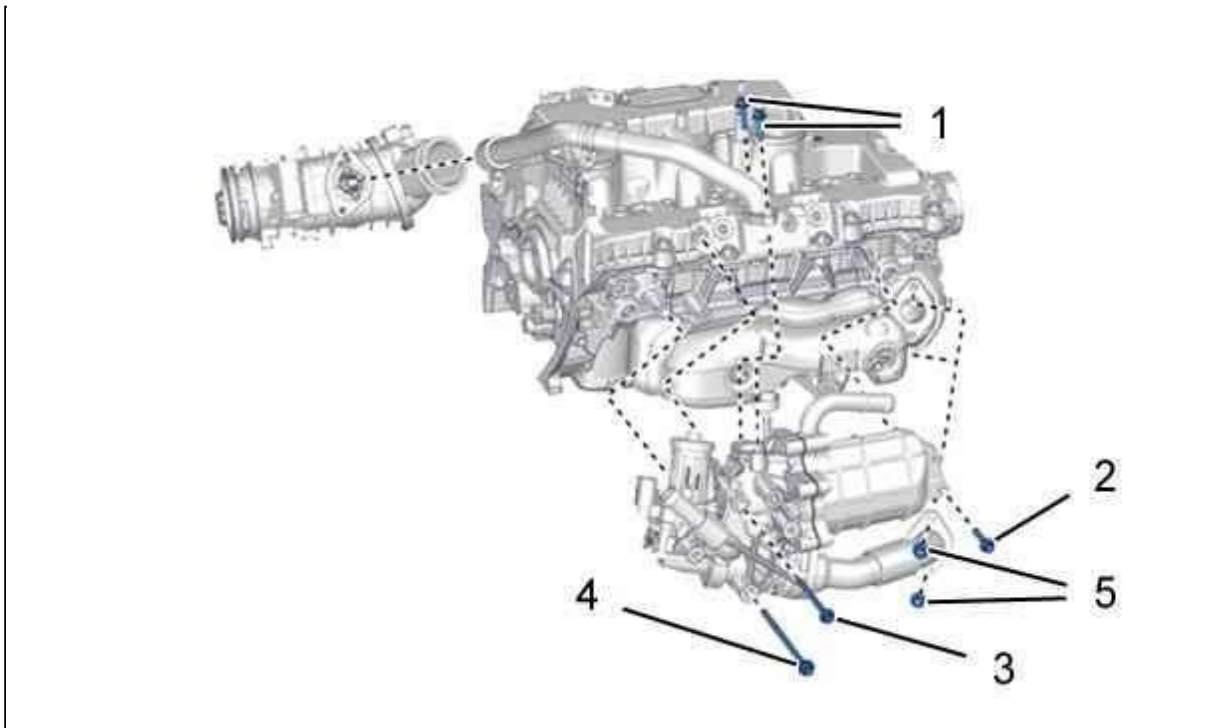


Figure : B1JB08JD

Reference	Designation	Tightening procedure
(1)	Output pipes from the exhaust gas recycling solenoid valve (E.G.R)	Tightening torque to <b>10 Nm</b>
(2)	bolts M6x45 - Exhaust gas recycling solenoid valve (E.G.R) - Cylinder heads	Tightening torque to <b>10 Nm</b>
(3)	bolts M6x80 - Exhaust gas recycling solenoid valve (E.G.R) - Cylinder heads	Tightening torque to <b>10 Nm</b>
(4)	bolts M6x105 - Exhaust gas recycling solenoid valve (E.G.R) - Cylinder heads	Tightening torque to <b>10 Nm</b>
(5)	bolts - Exhaust gas recycling solenoid valve (E.G.R) -Exhaust manifolds	Tightening torque to <b>10 Nm</b>

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### 3. turbocharger

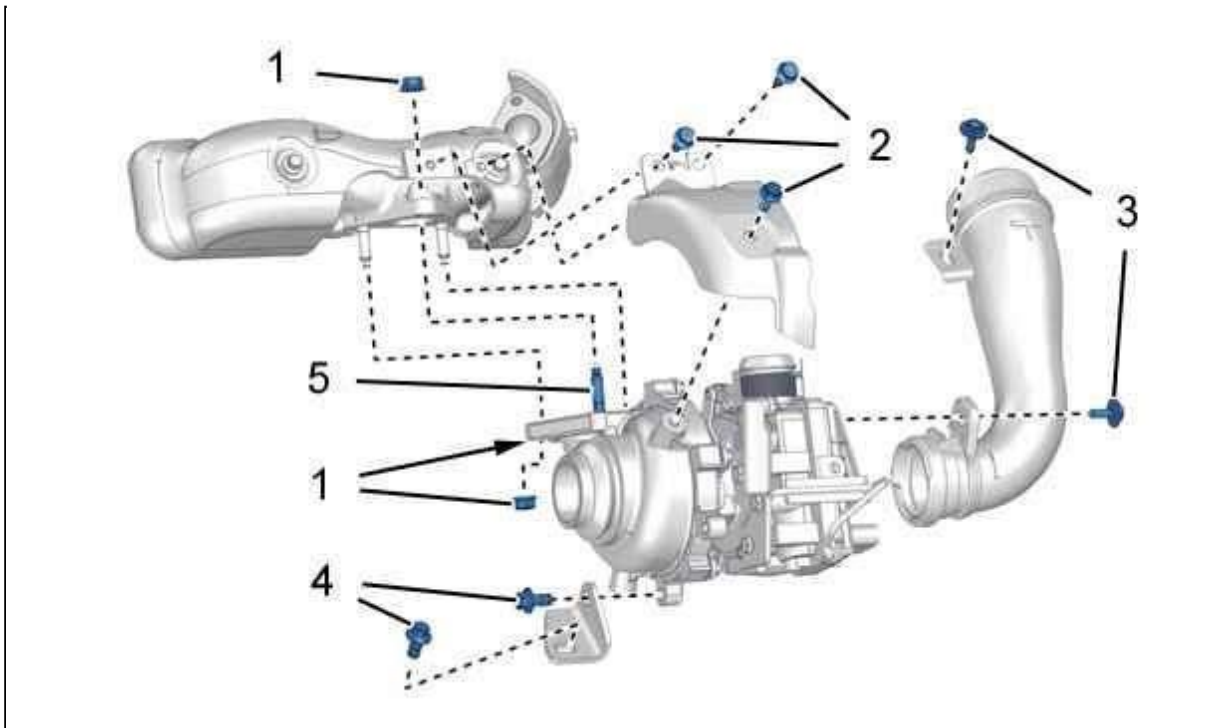
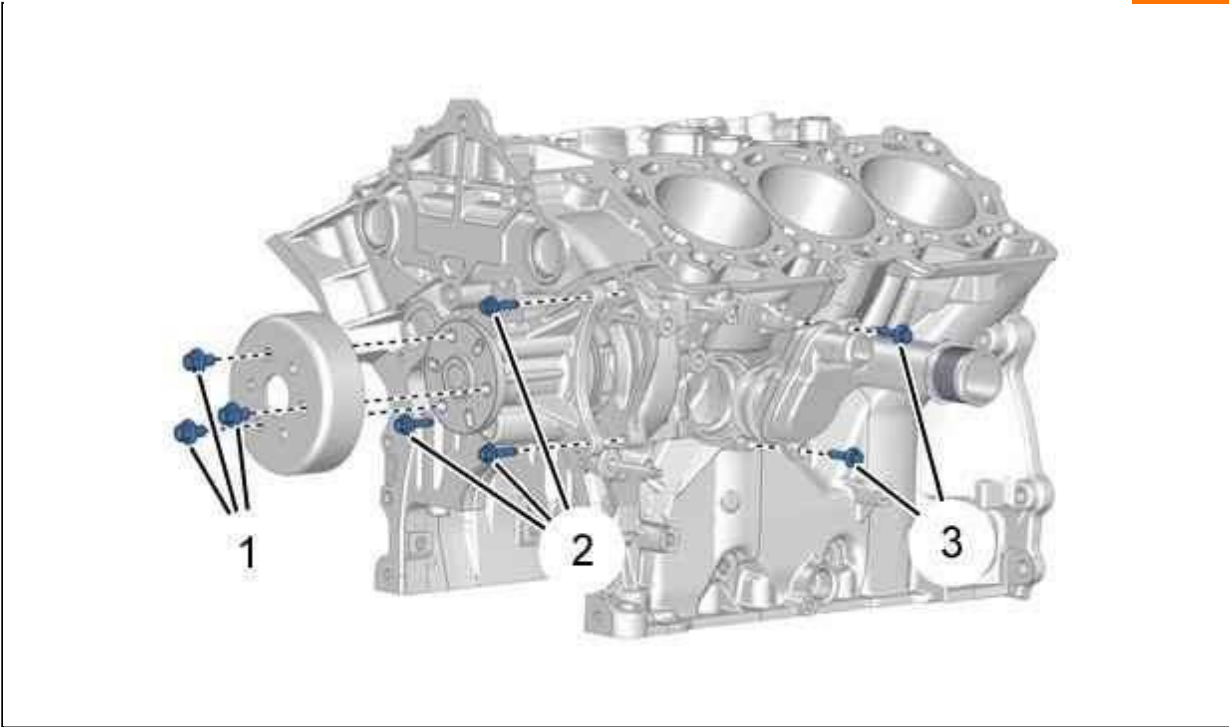


Figure : B1HB09RD

Reference	Designation	Tightening procedure
(1)	nuts - turbocharger	Tightening torque to <b>24 Nm</b>
(2)	bolts - Turbocharger heat shields	Tightening torque to <b>9 Nm</b>
(3)	bolts - Turbocharger air inlet union	Tightening torque to <b>9 Nm</b>
(4)	bolts - Turbocharger connection mounting - Cylinder block (/)	Tightening torque to <b>33 Nm</b>
(5)	studs - turbocharger	Tightening torque to <b>13 Nm</b>

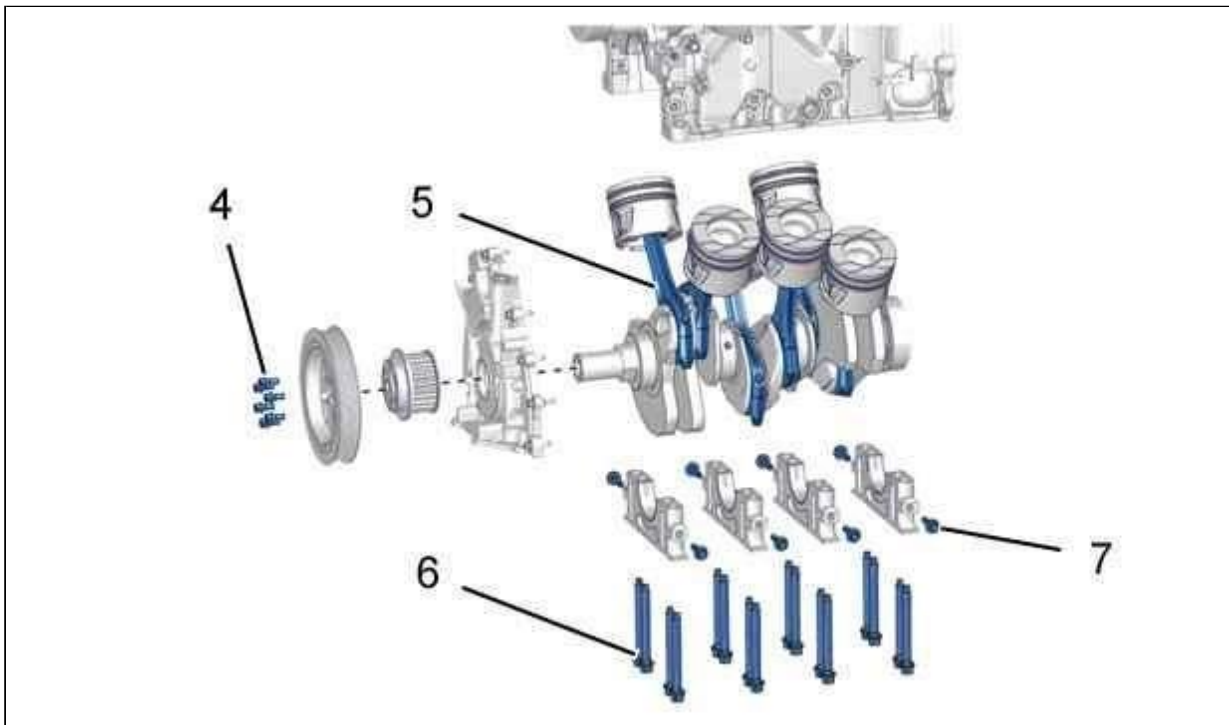


**5. Cylinder block (7)**

CAUTION : (\*) Follow the tightening sequence.

Figure : B1CB00TD

Reference	Designation	Tightening procedure
(1)	bolts - Water pump pulley	Tightening torque to <b>25 Nm</b>
(2)	bolts - Coolant pump	Tightening torque to <b>10 Nm</b>
(3)	Water inlet housing	Tightening torque to <b>10 Nm</b>



Reference	Designation	Tightening procedure
(4)	bolts - Accessories drive pulley	Tightening torque to 25 Nm
(5)	Conrod screws	Pre-tighten to 20 Nm
		Angular tightening to 90°
(6)	Crankshaft bearing caps fixing bolt (*)	Pre-tighten to 60 Nm
		Tightening torque to 145 Nm
		Angular tightening to 90°
(7)	bolts - Crankshaft main bearing cap casing (*)	Pre-tighten to 15 Nm
		Tightening torque to 33 Nm
		Angular tightening to 47°

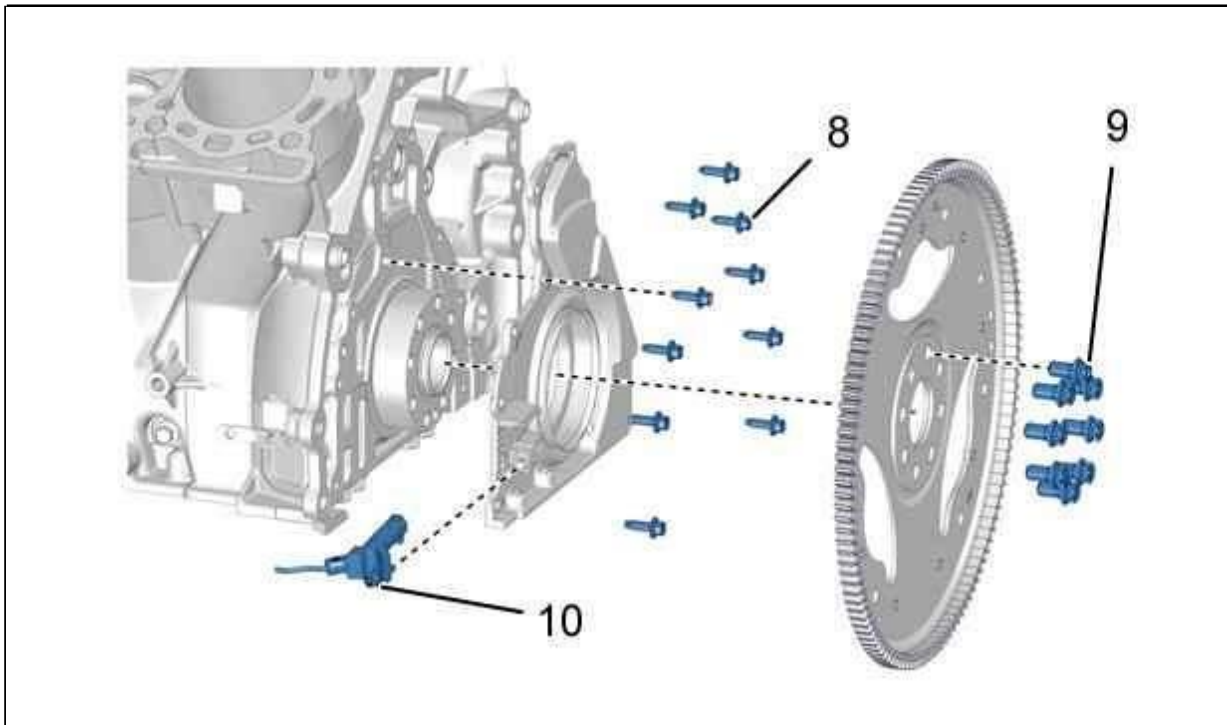


Figure : B1CB00UD

Reference	Designation	Tightening procedure
(8)	Closing plate fixing screws (Gearbox end ) (*)	Tightening torque to 10 Nm
(9)	Bolts – Starter gearwheel carrier(*)	Pre-tighten to 50 Nm
		Angular tightening to 45°
		Angular tightening to 45°
(10)	Engine speed sensor	Tightening torque to 5 Nm



#### 4.1. Sequence of tightening the bolts (6)

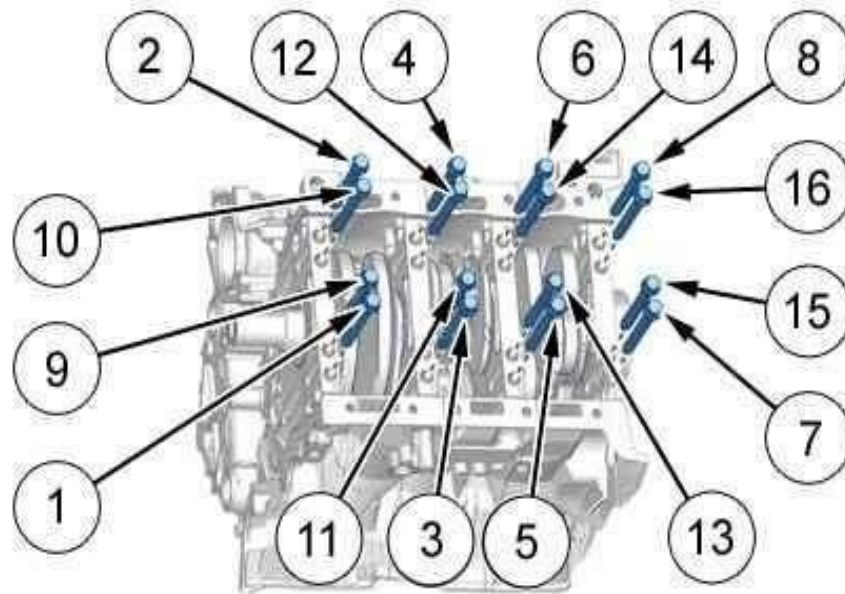


Figure : B1CB00VD

**CAUTION :** After each tightening check that the crankshaft turns freely in its bearings.

(6) Crankshaft bearing caps fixing bolt .

Tightening procedure : Crankshaft bearing cap bolts :

1. Pre-tighten the 16 bolts (6) to 60 Nm (From 1 to 16 )
2. Tighten the 16 screws (6) to 145 Nm (From 1 to 16 )
3. Angle tighten the 16 bolts (6) to 90° (From 1 to 16 )

## 4.2. Sequence of tightening the bolts (7)

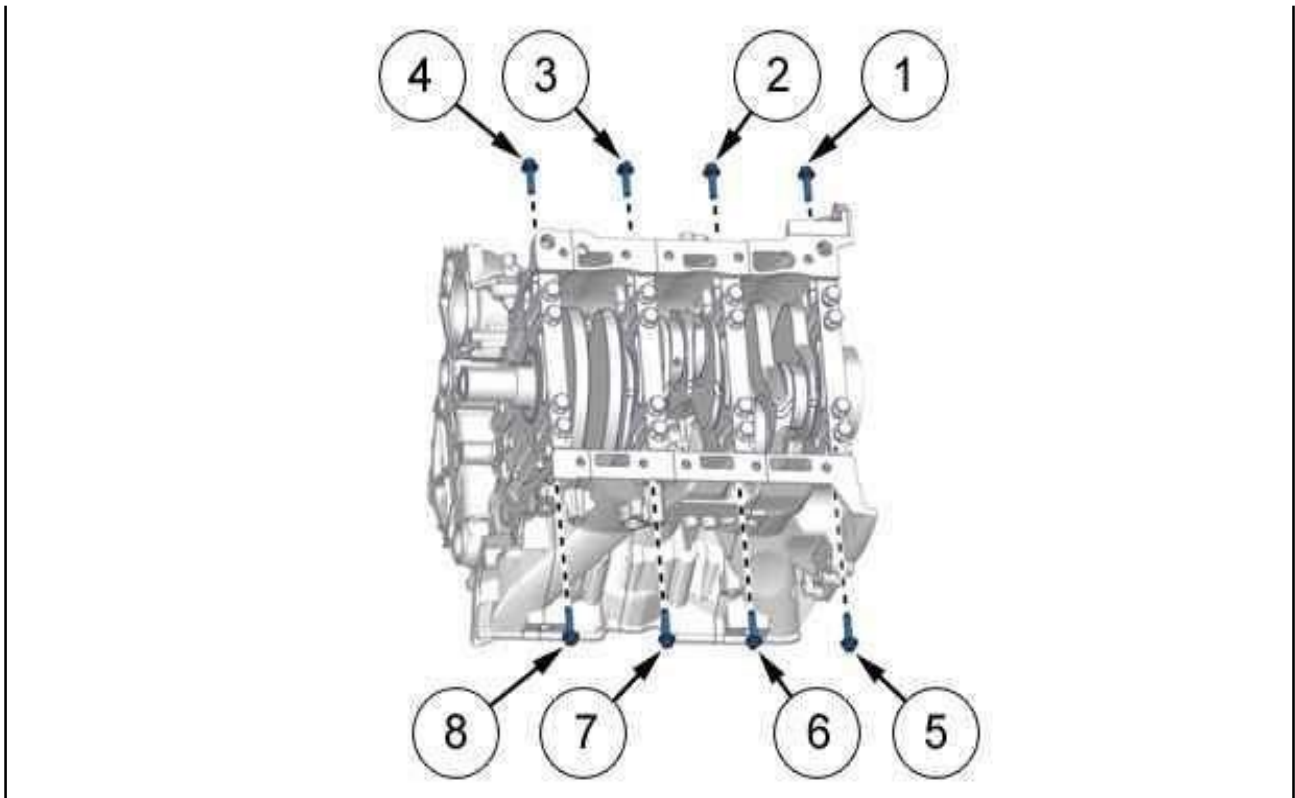


Figure : B1CB00WD

Crankshaft bearing cap housing fixing screws : Crankshaft bearing cap housing fixing screws :

1. Pre-tighten the 8 bolts (7) to 15 Nm (From 1 to 8 )
2. Tighten the 8 screws (7) to 33 Nm (From 1 to 8 )
3. Angle tighten the 8 bolts (7) to 47° (From 1 to 8 )

#### 4.4. Sequence of tightening the bolts (8)

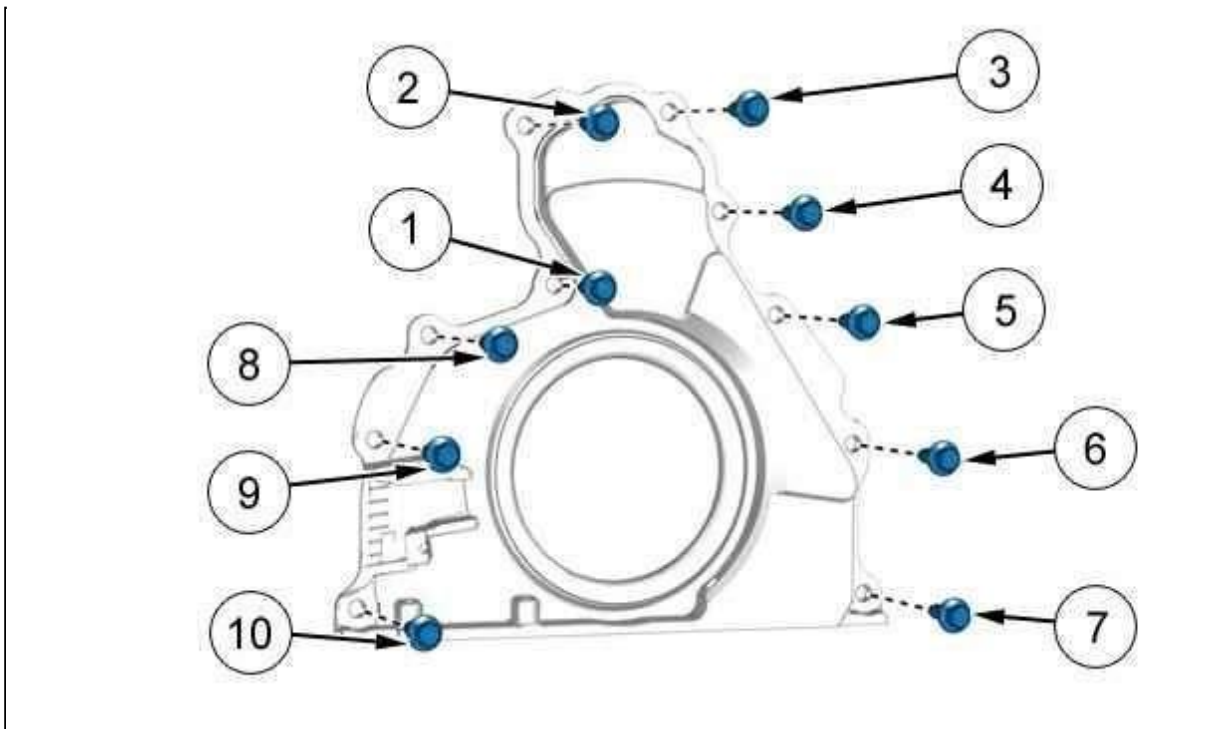


Figure : B1CB00XD

(8) Closing plate fixing screws (Gearbox end ).

Tightening procedure : Closing plate (Gearbox end ) :

1. Tighten the bolt (8) by hand (1)
2. Tighten the 9 bolts (8) by hand (From 2 to 10 )
3. Tighten the 10 screws (8) to 10 Nm (From 1 to 10 )

#### 4.4. Sequence of tightening the bolts (9)

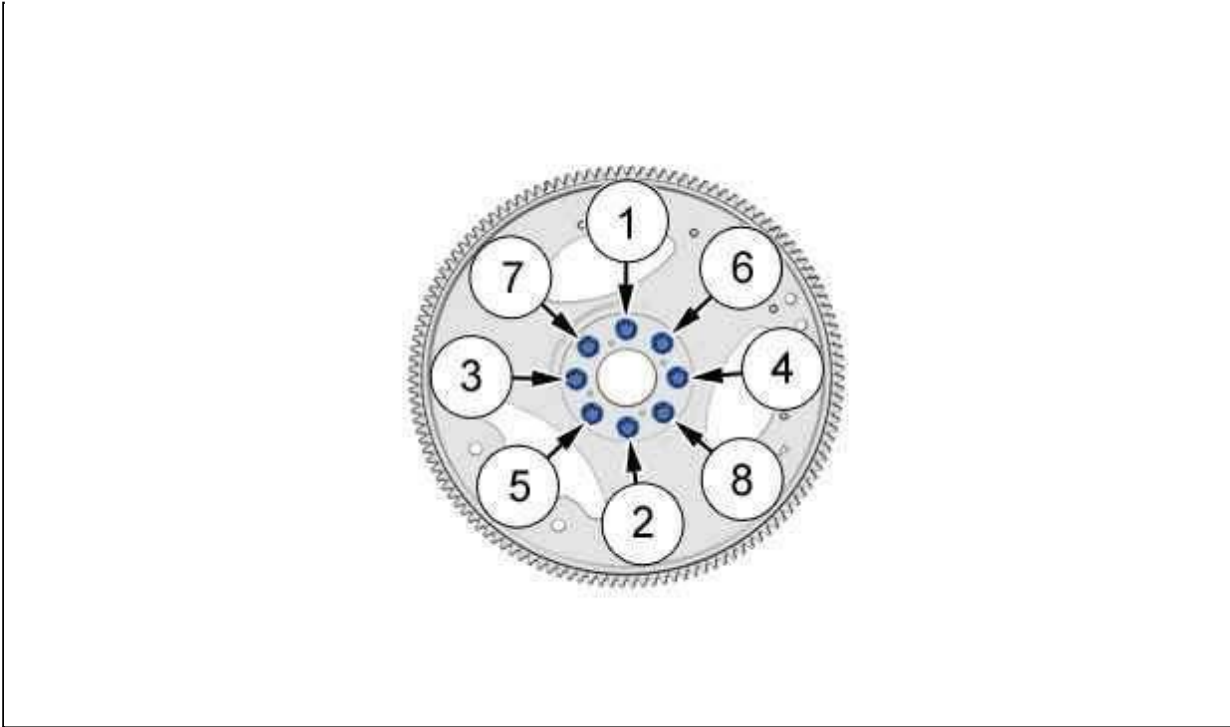


Figure : B1CB00YD

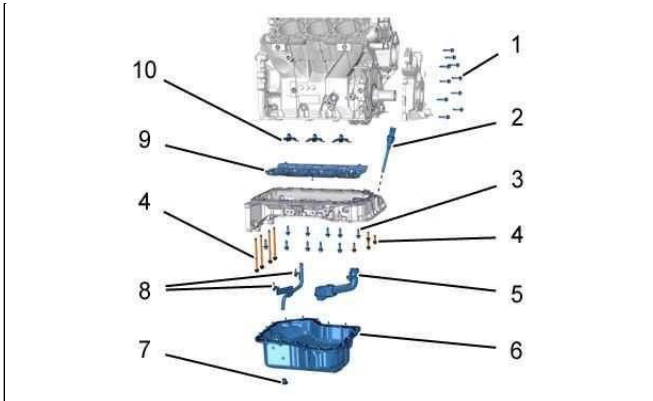
(9) Cap holder bolt of the starter motor.

Reference	Designation	Tightening procedure
(9)	Bolts – Starter gearwheel carrier(*)	Pre-tighten to 50 Nm
		Angular tightening to 45°
		Angular tightening to 45°

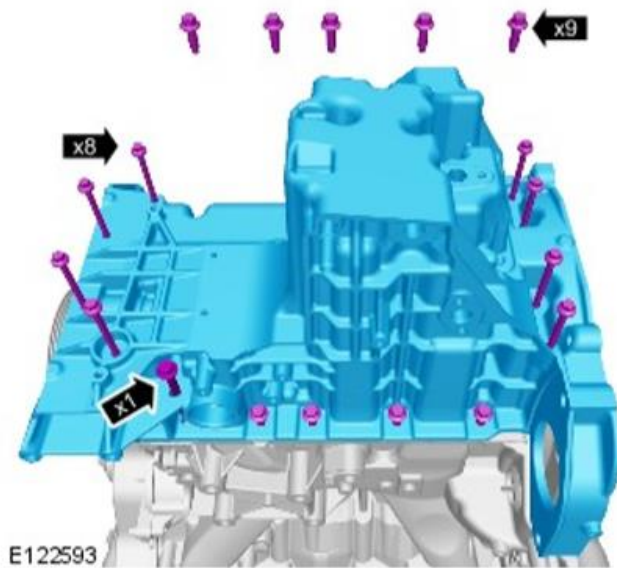
## 5. Lubrication

CAUTION : (\*) Follow the tightening sequence.

### DT20C Sump



### Land Rover Sump



Reference	Designation	Tightening procedure
(1)	bolts - oil pump (*)	Pre-tighten to 4 Nm
		Tightening torque to 9 Nm
(2)	Oil level sensor	Tightening torque to 27 Nm
(3)	bolts M8 - Engine sump (*)	Pre-tighten to 10 Nm
		Tightening torque to 23 Nm
(4)	bolts M6 - Engine sump (*)	Pre-tighten to 4 Nm
		Tightening torque to 10 Nm
(5)	Oil suction strainer	Tightening torque to 9 Nm

(6)	bolts - sump (*)	Pre-tightening to 4 Nm
		Tightening torque to 9 Nm
(7)	drain plug	Tightening torque to 23 Nm
(8)	Lower dipstick guide tube	Tightening torque to 9 Nm
(9)	Oil deflector	Tightening torque to 9 Nm
(10)	Piston skirt spray jets	Tightening torque to 10 Nm

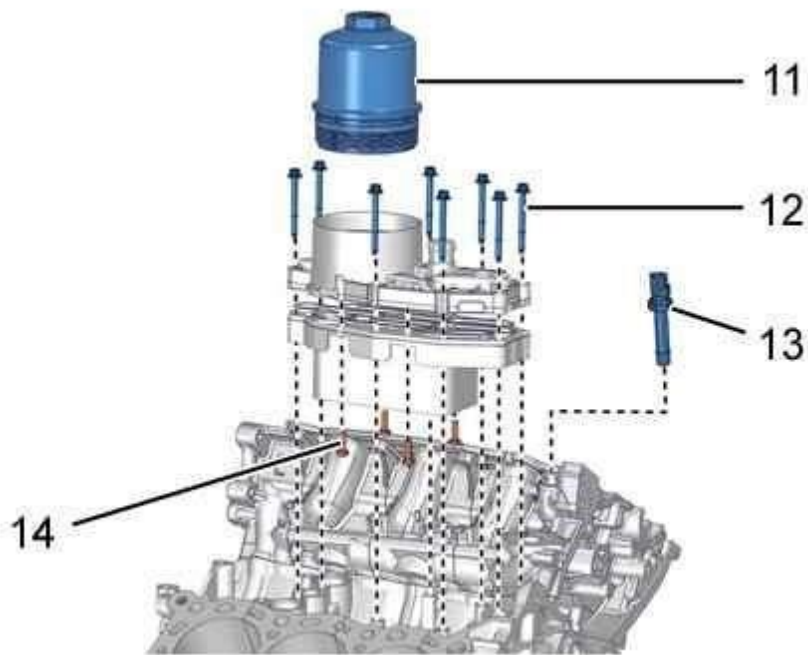
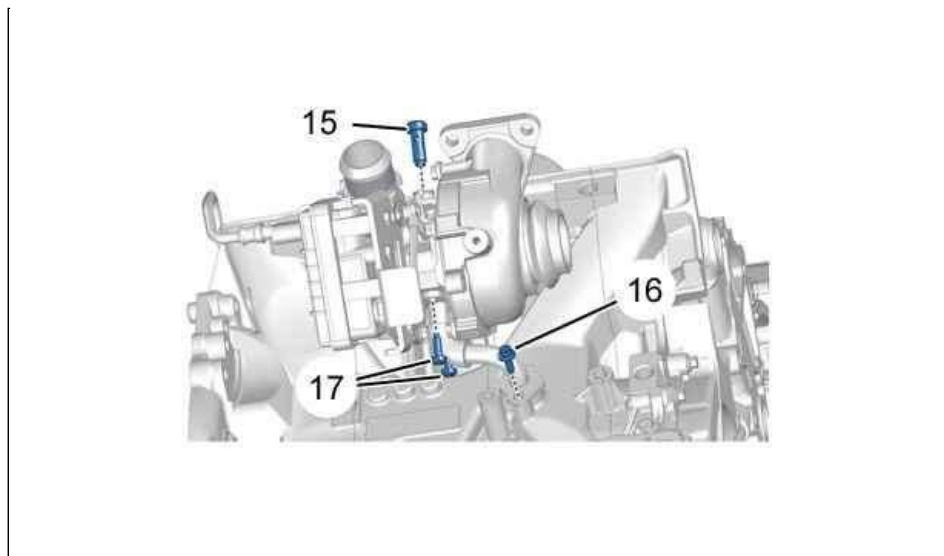
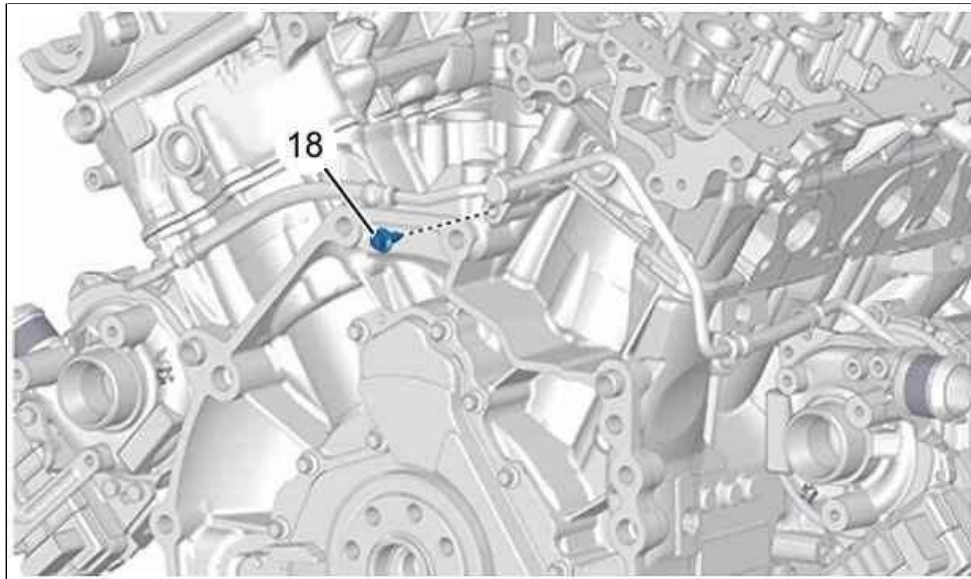


Figure : B1FB00QD

Reference	Designation	Tightening procedure
(11)	Oil filter cover	Tightening torque to 25 Nm
(12)	bolts - Oil filter support (*)	Tightening torque to 9 Nm
(13)	Oil pressure sensor	Tightening torque to 13 Nm
(14)	bolts - coolant/oil heat exchanger	Tightening torque to 9 Nm



Reference	Designation	Tightening procedure
(15)	bolts - Turbocharger lubrication feed pipe	Tightening torque to 30 Nm
(16)	bolts - Turbocharger lubrication return pipe -	Cylinder block Side - Tightening torque to 9 Nm
(17)	bolts - Turbocharger lubrication return pipe	Tightening torque to 9 Nm



Reference	Designation	Tightening procedure
(18)	bolts - Turbocharger lubrication feed pipe -	Cylinder block side - Tightening torque to 9 Nm

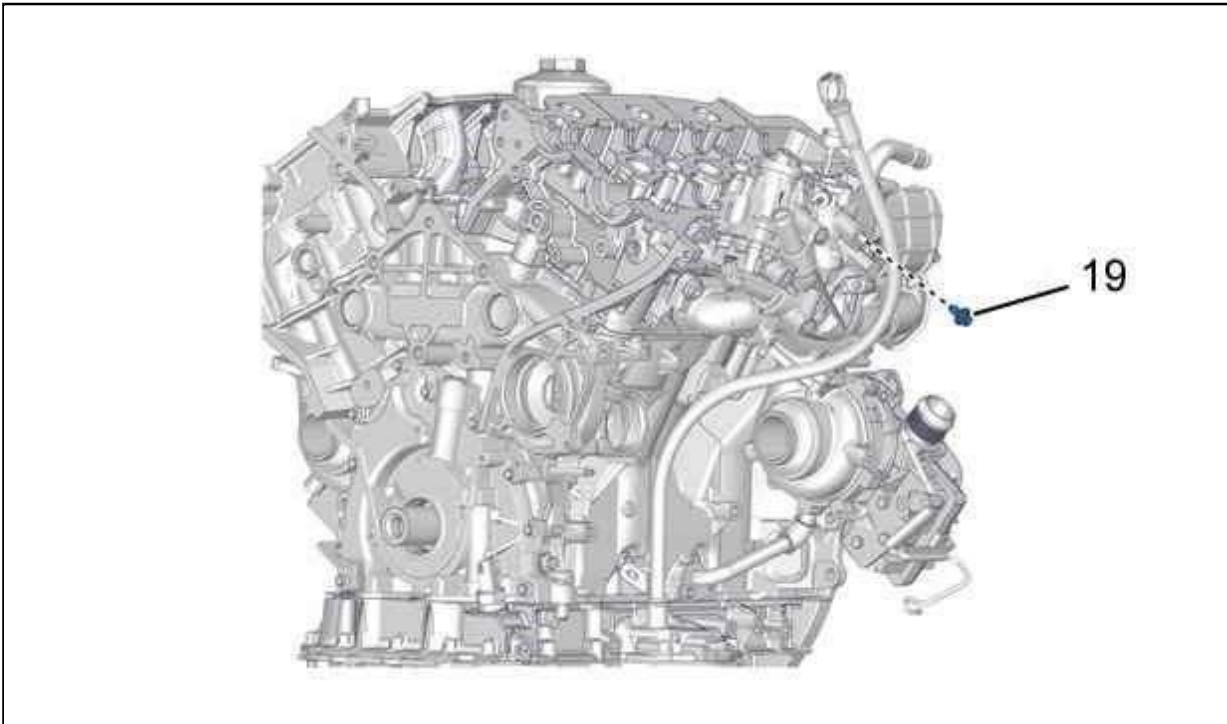


Figure : B1CB010D

Reference	Designation	Tightening procedure
(19)	bolts - Dipstick guide tube	Tightening torque to 9 Nm



## 5.1. Sequence of tightening the bolts (1)

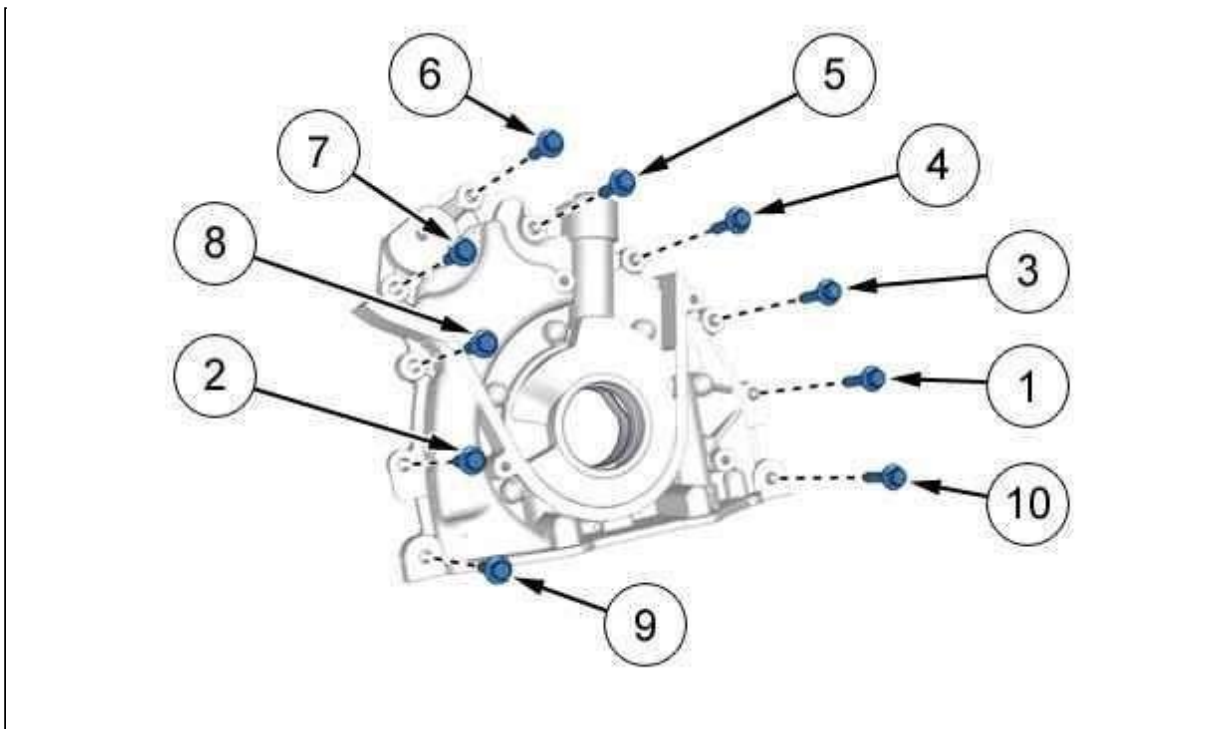


Figure : B1FB00RD

(1) Oil pump fixing bolts .

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Tightening procedure : Fixing bolts of the oil pump : ☐ Tighten the 2 bolts (1) by hand ( 1 and 2 )

1. Tighten the 8 bolts (1) by hand (From 3 to 10 )
2. Pre-tighten the 10 bolts (1) to 4 Nm (From 1 to 10 )
3. Tighten the 10 screws (1) to 10 Nm (From 1 to 10 )

## 5.2. Sequence of tightening the bolts (3), (4)

(3) bolts M8 - Engine sump.

(4) bolts M6 - Engine sump.

### DT20C Sump

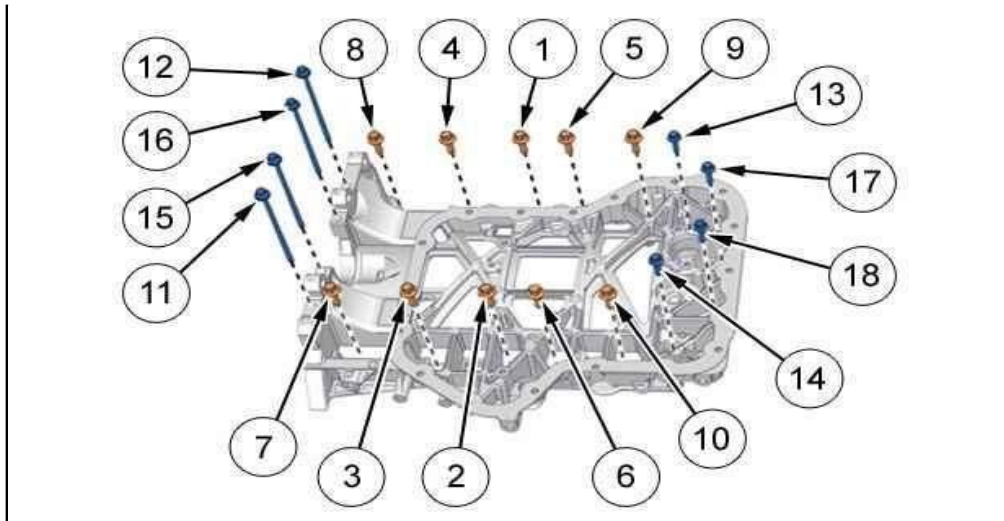
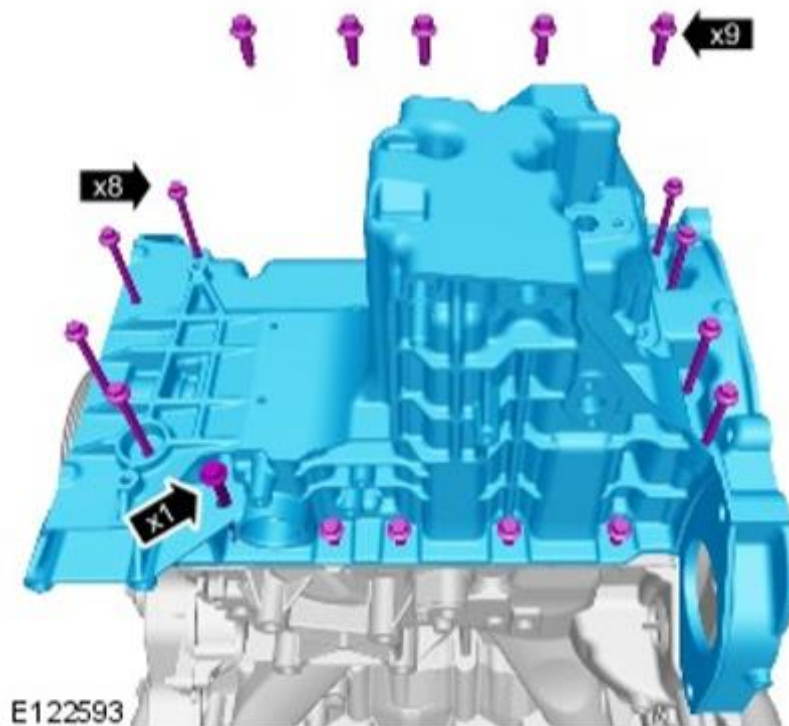


Figure : B1CB011D

### Land Rover Sump

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Tightening procedure : Engine sump :

1. Tighten the 18 bolts (3), (4) by hand (From 1 to 18 )
2. Pre-tighten the 10 bolts (3) to 10 Nm (From 1 to 10 )
3. Tighten the 10 screws (3) to 23 Nm (From 1 to 10 )
4. Pre-tighten the 8 bolts (4) to 4 Nm (From 11 to 18 )
5. Tighten the 8 screws (4) to 10 Nm (From 11 to 18 )

### 5.3. Sequence of tightening the bolts (6)

ONLY DT20C Metal Sump/Pan

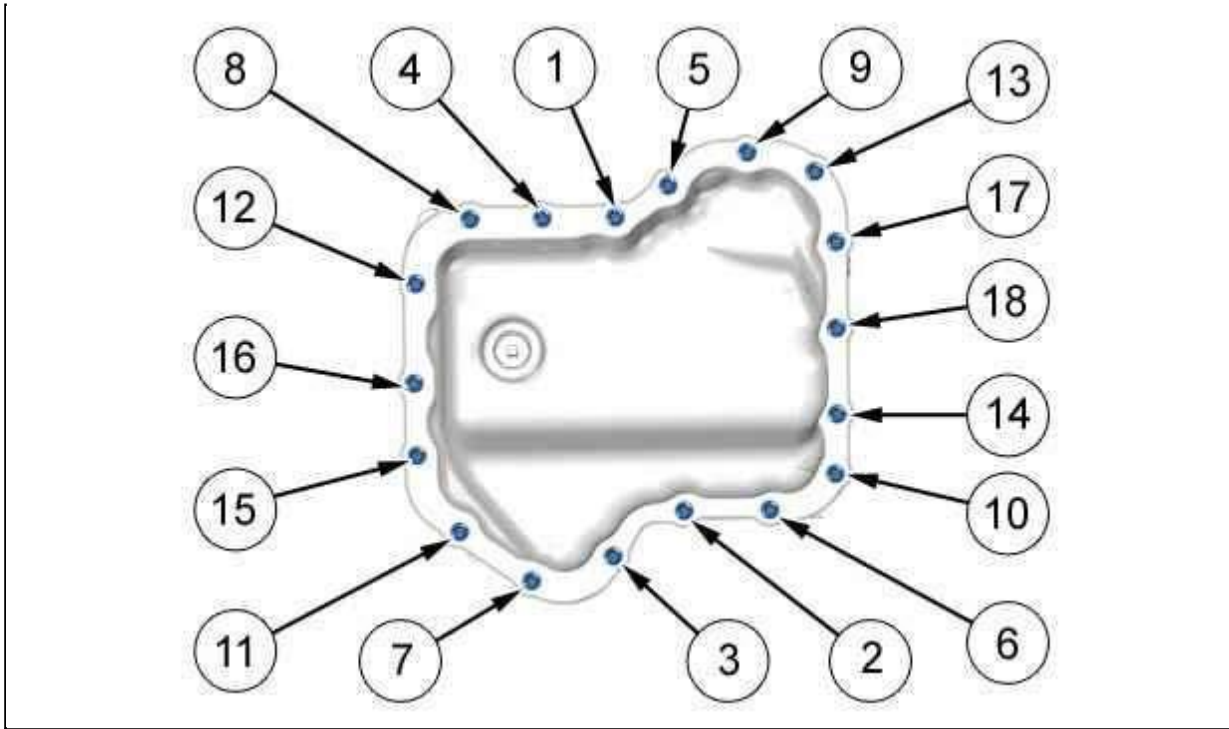


Figure : B1FB00SD

Tightening procedure - Fixing bolts of the oil sump :

1. Tighten the 4 bolts (6) by hand : In the following order (8, 10, 11, 13)
2. Pre-tighten the 18 bolts (6) to 4 Nm (From 1 to 18 )
3. Tighten the 18 screws (6) to 10 Nm (From 1 to 18 )

### 5.4. Sequence of tightening the bolts (12)

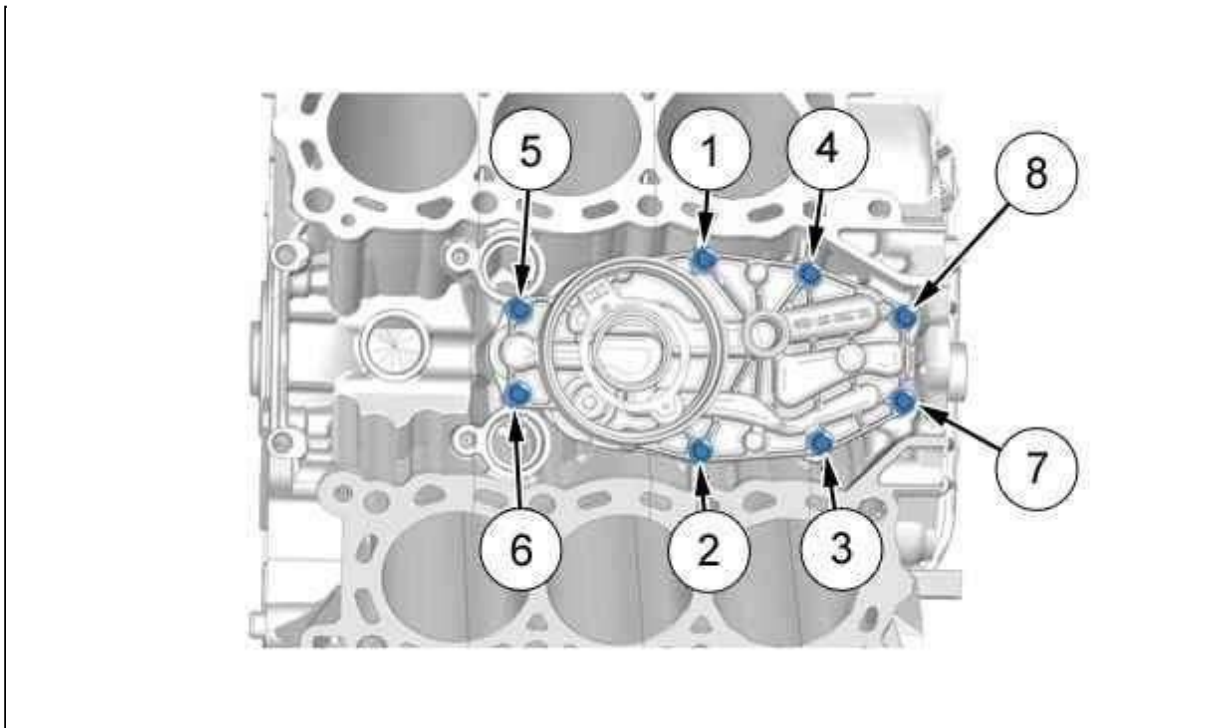


Figure : B1FB00TD

(12) bolts - Oil filter support.

Reference	Designation	Tightening procedure
(12)	bolts - Oil filter support (*)	Tightening torque to 9 Nm

## 6. Timing gear

### 6.1. Tightening torques

CAUTION : (\*) Follow the tightening sequence.

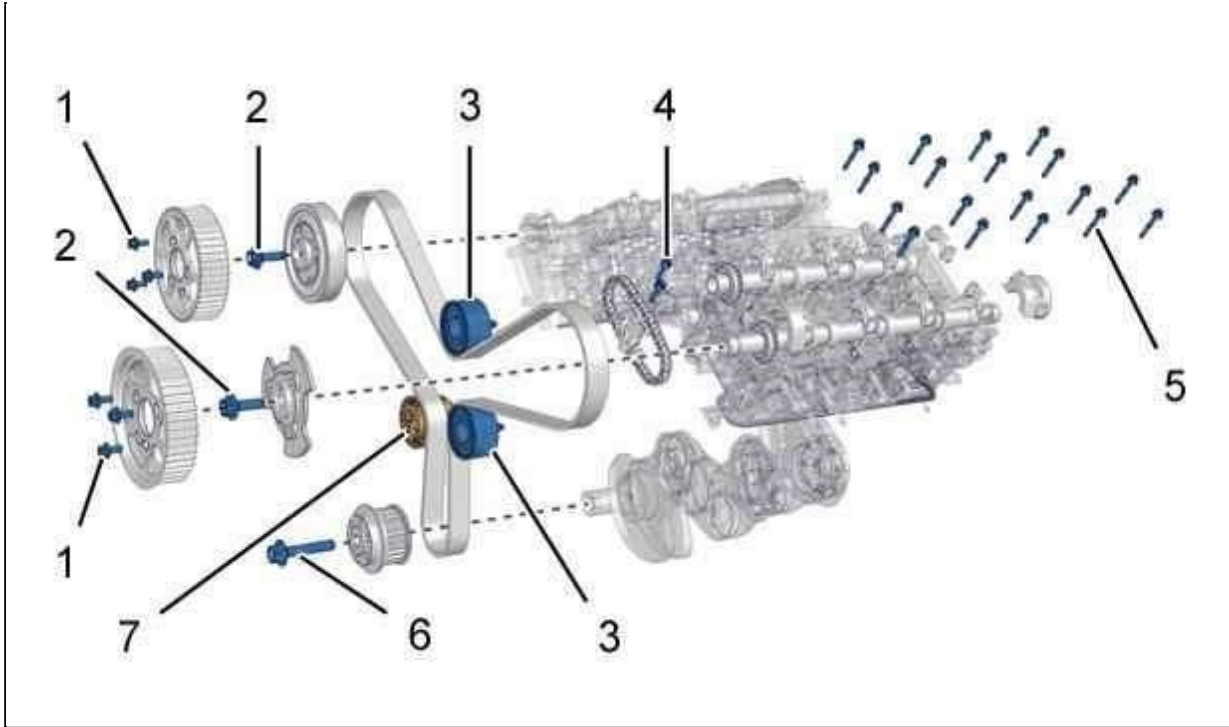


Figure : B1EB00AD

Reference	Designation	Tightening procedure
(1)	bolts - Camshaft pulleys	Tightening torque to 23 Nm
(2)	Camshaft pulley hub screws	Tightening torque to 80 Nm Angular tightening to 90°
(3)	Timing belt idler roller bolt	Tightening torque to 45 Nm
(4)	Camshaft timing chain tensioner bolt	Tightening torque to 10 Nm
(5)	Camshaft bearing bolts (*)	Pre-tighten to 5 Nm Tightening torque to 10 Nm
(6)	Screw fixing the timing pinion to the crankshaft	Tightening torque to 300 Nm Angular tightening to 90°
(7)	Timing belt tensioner roller bolt	Tightening torque to 26 Nm

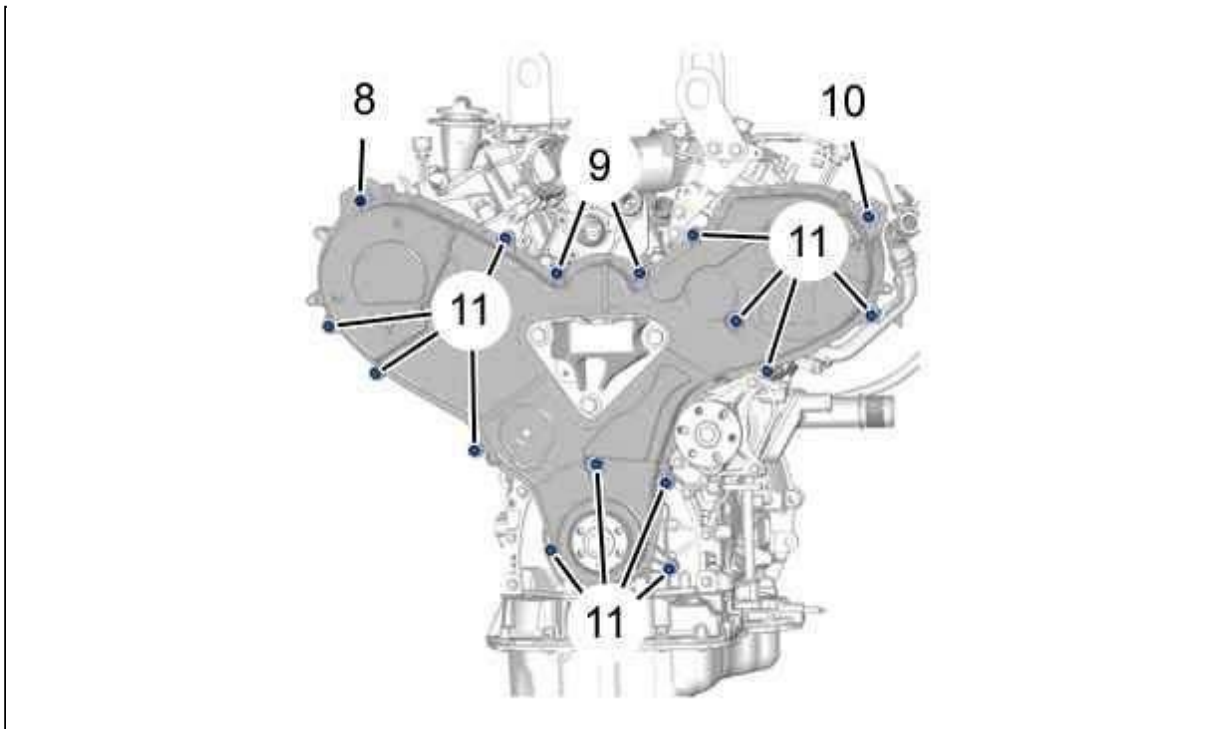


Figure : B1CB012D

Reference	Designation	Tightening procedure
(8)	nut - Timing cover	Tightening torque to 9 Nm
(9)	bolts M6x36 - Timing cover	Tightening torque to 9 Nm
(10)	bolts M6x30 - Timing cover	Tightening torque to 9 Nm
(11)	bolts M6x32 - Timing cover	Tightening torque to 9 Nm

## 6.2. Sequence of tightening the bolts (5)

CAUTION : The camshaft bearing caps are identified at "a" by a letter on the front cylinder head and a figure on the rear cylinder head and the notches "b" must point towards the centre of each cylinder head.

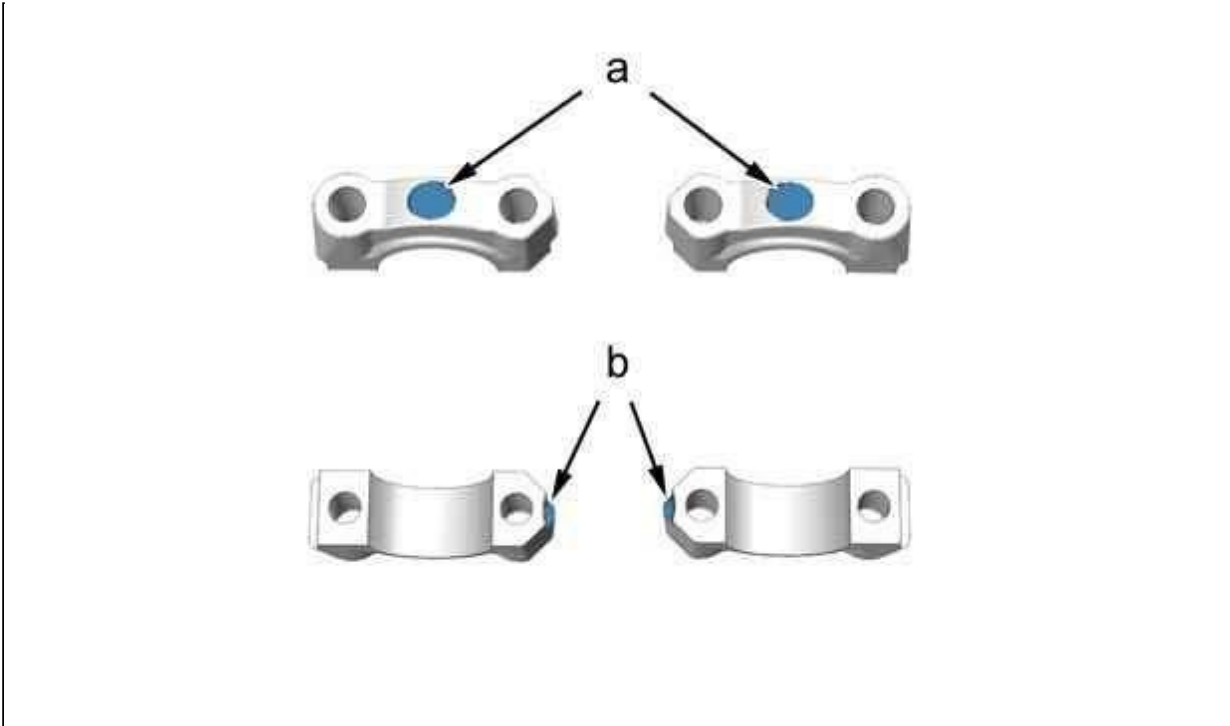


Figure : B1EB00BD

Camshaft bearing caps.

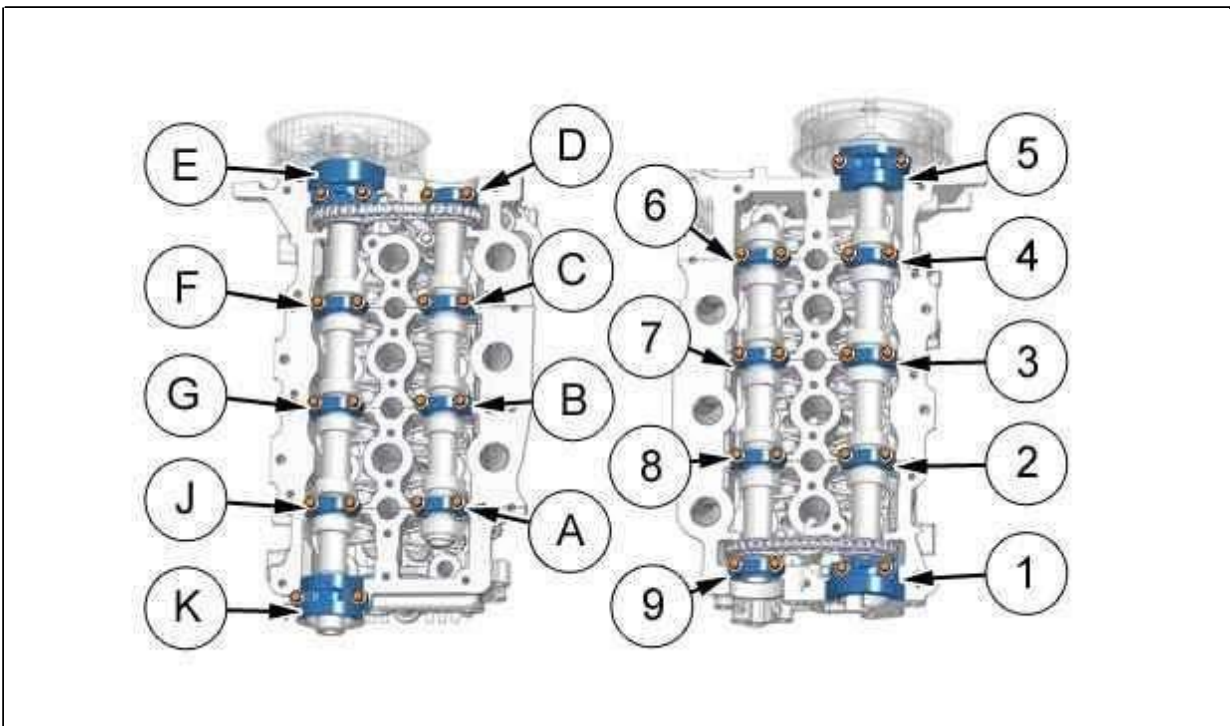


Figure : B1EB00CD

(5) Camshaft bearing bolts.



Tightening procedure : Camshaft bearing bolts :

1. Pre-tighten the screws ( 5) of the camshaft bearing caps **by hand**, in the following sequence: 9, 8, 7, 6, 4, 3, 2, D, C, B, A, J, G and F
2. Pre-tighten the screws (5) of the camshaft bearing caps to **5 Nm**, in the following sequence: , 8, 7, 6, 4, 3, 2, D, C, B, A, J, G and F
3. Tighten the screws (5) of the camshaft bearing caps to **10 Nm**, in the following sequence: 9, 8, 7, 6, 4, 3, 2, D, C, B, A, J, G and F

**CAUTION** : Place some sealing product LOCTITE 518 on the camshaft bearing caps 1, 5, E,K.

Refit the camshaft main bearing caps " 1", "5", "E" and "K" :

1. Pre-tighten the screws ( 5) of the camshaft bearing caps **by hand**, in the following sequence: 1, 5, E and K
2. Pre-tighten the screws (5) of the camshaft bearing caps to **5 Nm**, in the following sequence: 1, 5, E and K
3. Tighten the screws (5) of the camshaft bearing caps to **10 Nm**, in the following sequence: 1, 5, E and K

## 7. Injection system

### 7.1. Tightening torques

CAUTION : (\*) Follow the tightening sequence.

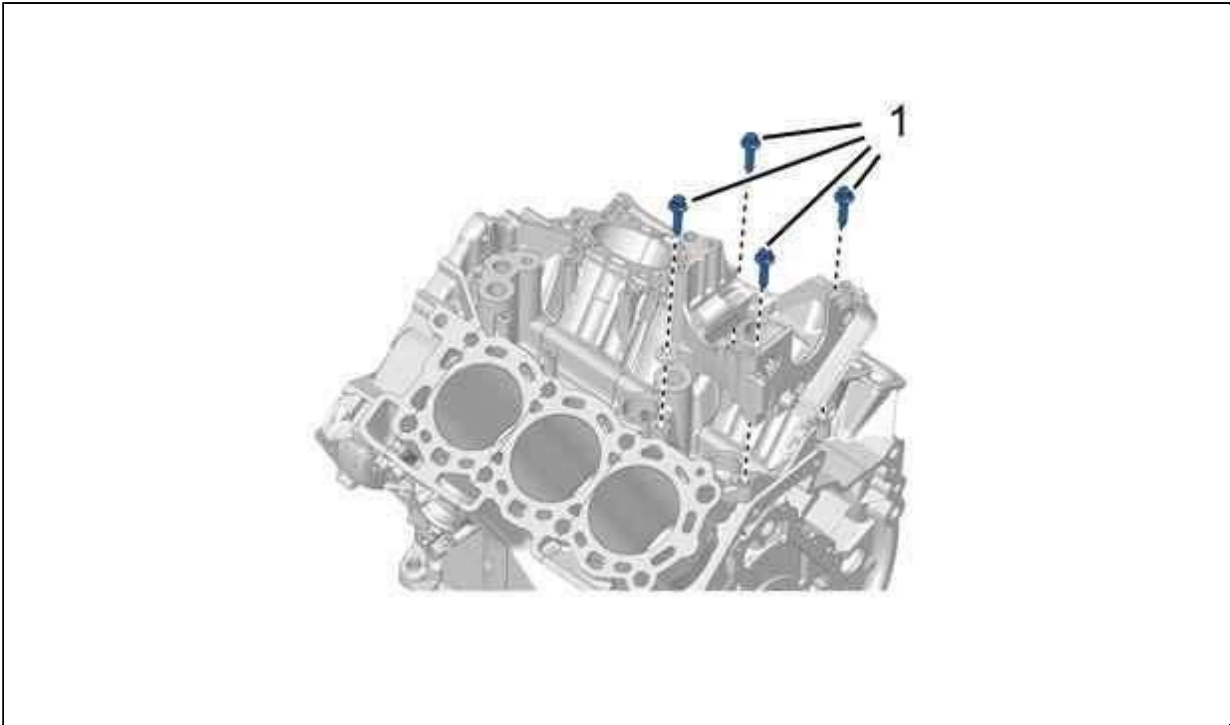


Figure : B1HB09TD

Reference	Designation	Tightening procedure ( Nm )
(1)	bolts - Diesel injection pump bracket	Tightening torque to <b>23 Nm</b>

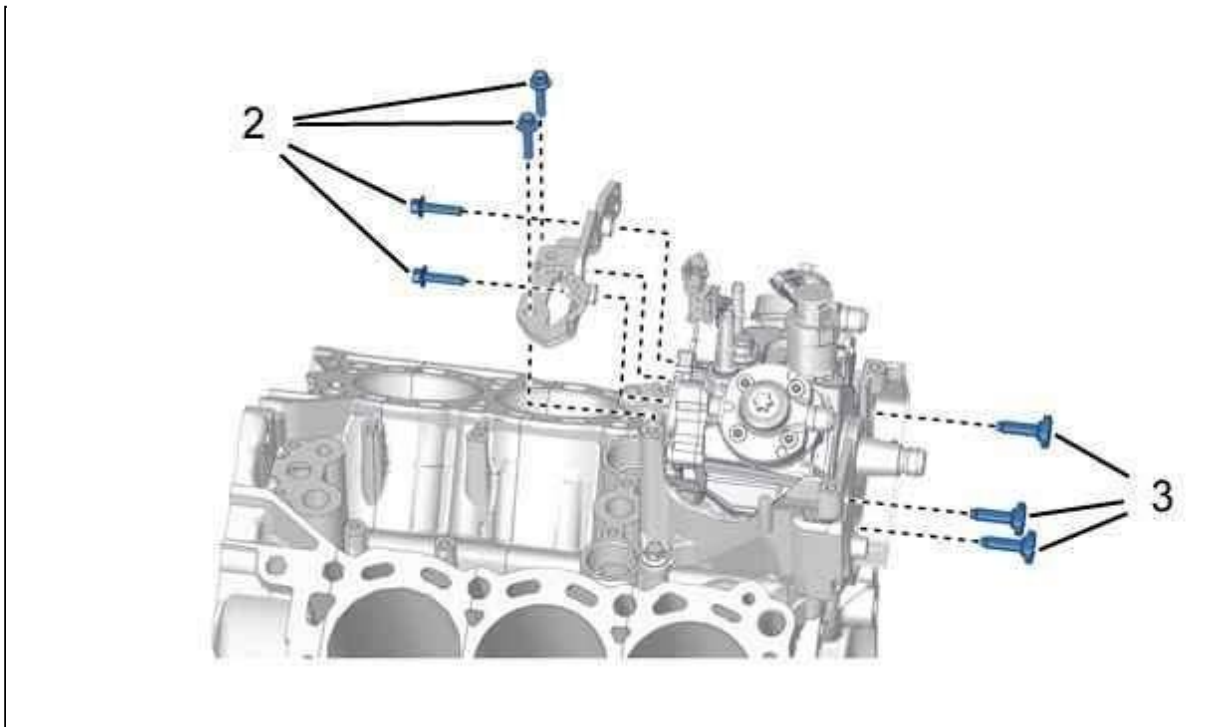
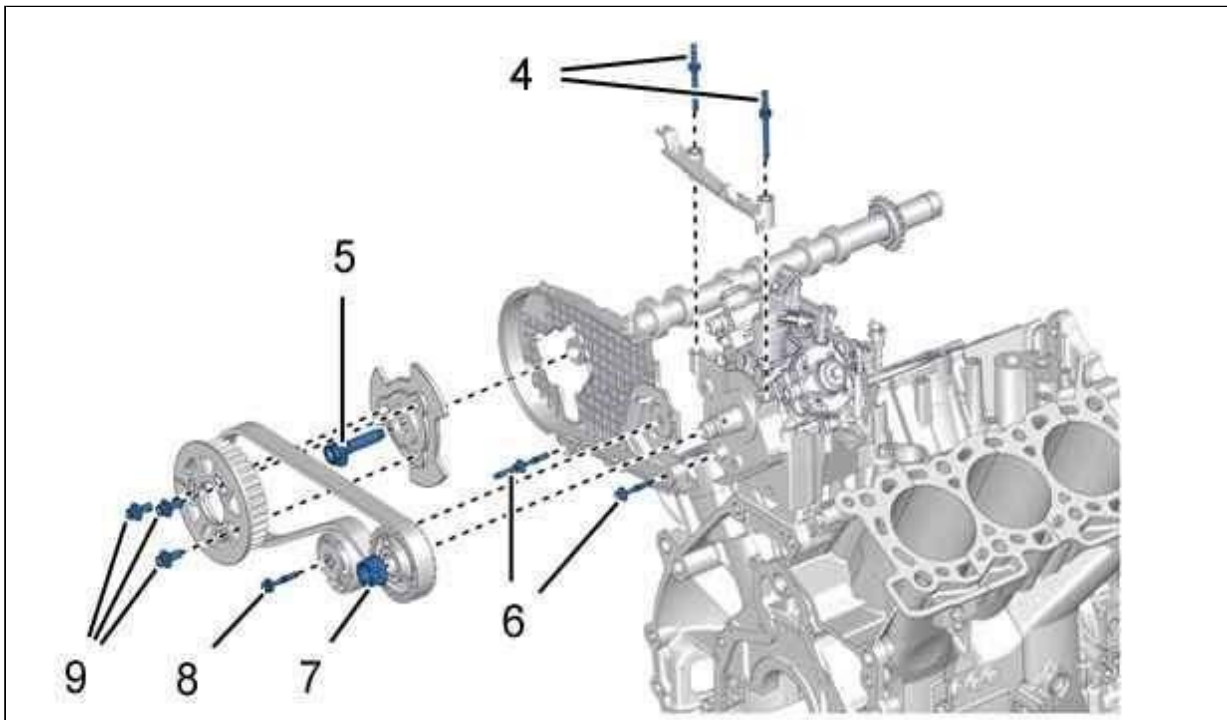


Figure : B1HB09UD

Reference	Designation	Tightening procedure
(2)	bolts - Diesel injection pump bracket	Tightening torque to <b>10 Nm</b>
(3)	bolts - Diesel injection pump on support	Tightening torque to <b>23 Nm</b>



Reference	Designation	Tightening procedure
(4)	Cover screw	Tightening torque to 9 Nm
(5)	bolts - Hub of the diesel injection pump drive pulley	Tightening torque to 80 Nm Angular tightening to 90°
(6)	Cover screw	Tightening torque to 9 Nm
(7)	Nut of the diesel injection pump pinion	Tightening torque to 50 Nm
(8)	bolts - Tensioner roller of the drive belt of the diesel injection pump	Tightening torque to 2, Nm
(9)	bolts - Drive pulley of the diesel injection pump	Tightening torque to 23 Nm

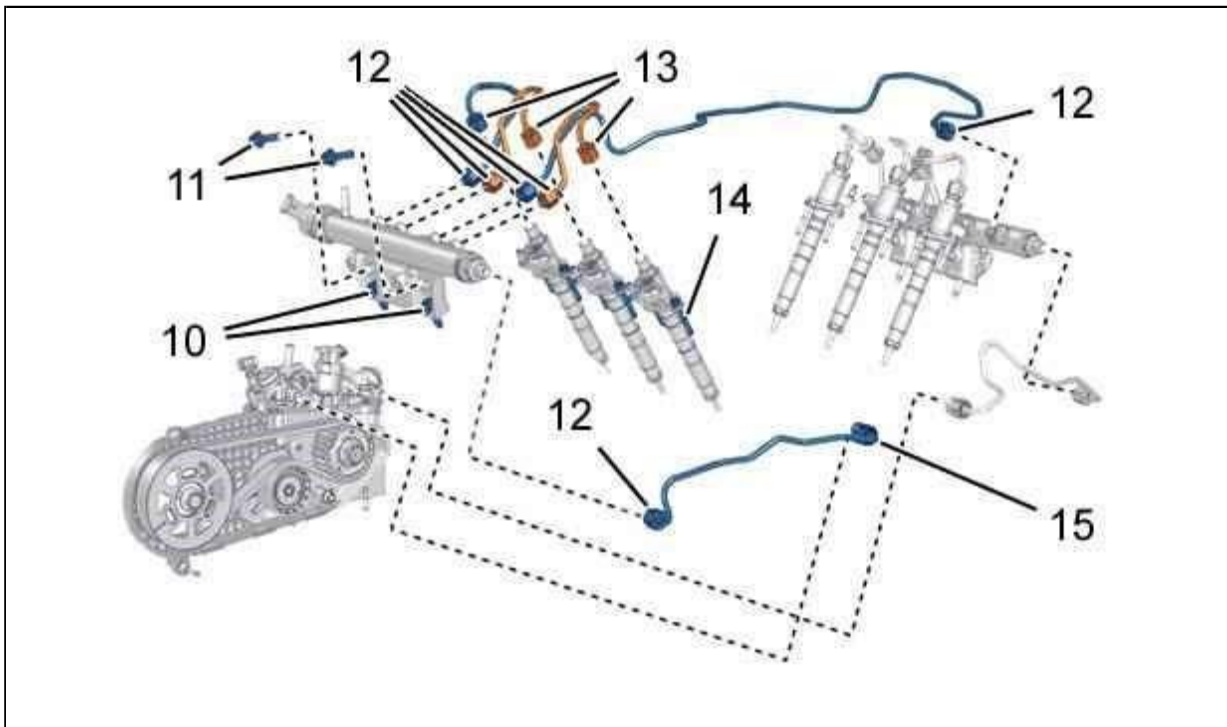


Figure : B1HB09VD

Reference	Designation	Tightening procedure
(10)	bolts - Injection rail mounting - Cylinder head	Tightening torque to 23 Nm
(11)	bolts - Injection rail mounting - Fuel high pressure common injection rail	Tightening torque to 23 Nm
(12)	Fuel high pressure common injection rail unions (*)	Pre-tighten to 15 Nm
		Tightening torque to 30 Nm
(13)	Unions on diesel injectors (*)	Pre-tighten to 15 Nm
		Tightening torque to 30 Nm
(14)	bolts - Diesel injector fixing clamps	Tightening torque to 9 Nm
(15)	Unions on diesel injection pump (*)	Pre-tighten to 15 Nm
		Tightening torque to 30 Nm

## 7.2. Order of tightening : Union pipes (12), (13), (15)

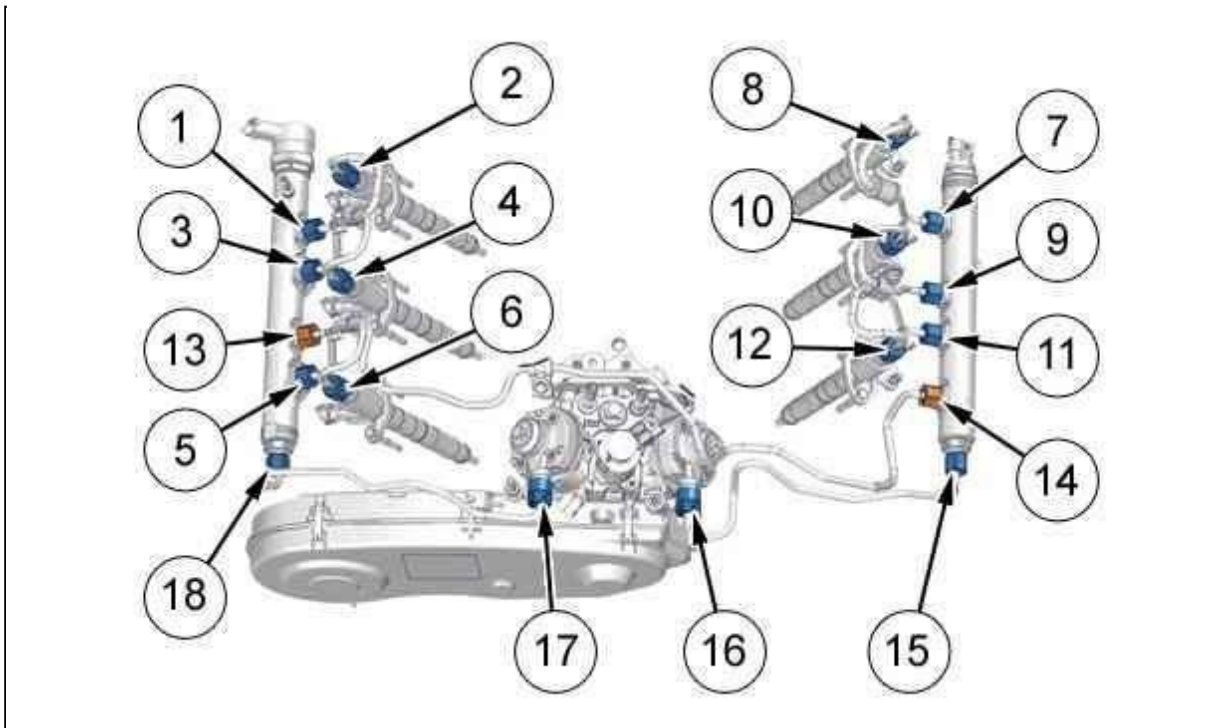


Figure : B1HB09WD

### Unions on fuel high pressure common injection rails.

### Unions on diesel injectors.

(15) Unions on diesel injection pump.

Tightening procedure : High-pressure fuel supply unions :

1. Pre-tighten the unions (12) of the common rails (13) and the injectors by hand (From 1 to 12 )
2. Pre-tighten the unions (12) of the common rails (13) and the injectors : to 15 Nm (From 1 to 12 )
3. Tightened the unions (12) of the common rails (13) and the injectors : to 30 Nm (From 1 to 12 )
  
4. Pre-tighten the unions (12) of the common rails by hand ( 13 and 14 )
5. Pre-tighten the unions (12) of the common rails : to 15 Nm ( 13 and 14 )
6. Tightened the unions (12) of the common rails to 30 Nm ( 13 and 14 )
  
7. Pre-tighten the unions (12) of the common rails (15) and the diesel injection pump by hand (From 15 to 18 )
8. Pre-tighten the unions (12) of the common rails (15) and the diesel injection pump : to 15 Nm (From 15 to 18 )
9. Tighten the unions (12) of the common rails (15) and of the diesel injection pump to 30 Nm (From 15 to 18 )