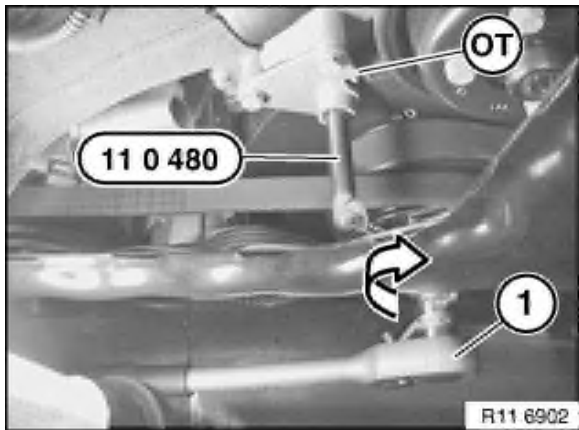
**Special tools required:**

- 11 0 480
- 11 2 300
- 11 6 050
- 11 7 130
- 11 7 160
- 11 7 200
- 11 7 342
- 11 9 130
- 11 9 140
- 11 9 170
- 12 6 050

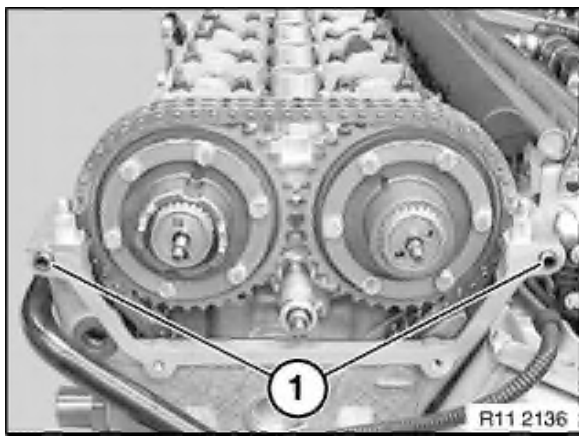
*Necessary preliminary tasks:*

- Check camshaft timing.
- Remove VANOS adjustment unit.

**Important!**

If the engine is cranked at the central bolt, the toothed shafts may fall out.

Secure engine with special tool 11 0 480 or 11 2 300 in **cylinder 1 firing TDC position**.



Release all 12 bolts on VANOS gears until toothed shaft can be pulled out of VANOS gear.

**Important!**

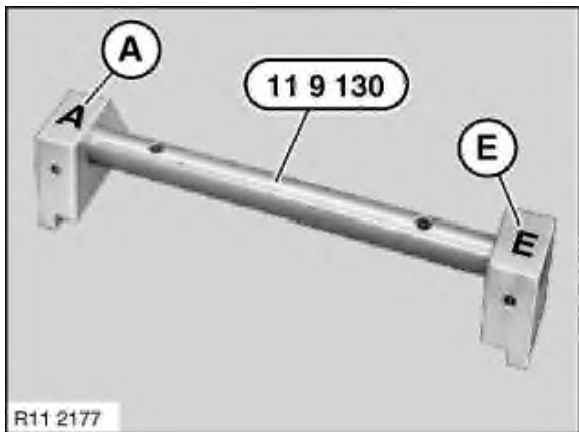
The VANOS adjustment travel on the exhaust side is less than that on the inlet side.

Danger of mixing up both toothed shafts.

Shank length of toothed exhaust shaft 21 mm.

Shank length of toothed inlet shaft 16 mm.

Remove both toothed shafts without tool.

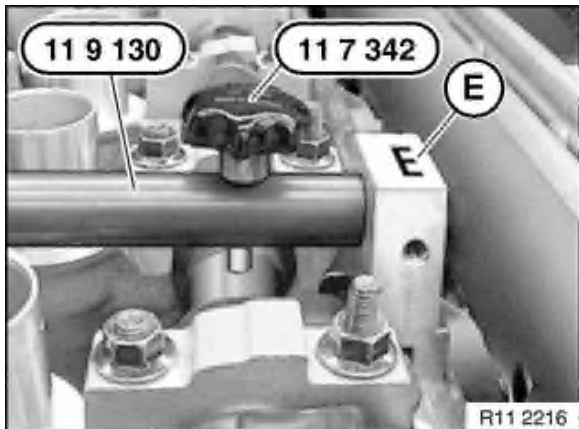


**Important!**

Pay attention to installation direction of special tool 11 9 130 .

(A) Exhaust side

(E) Inlet side



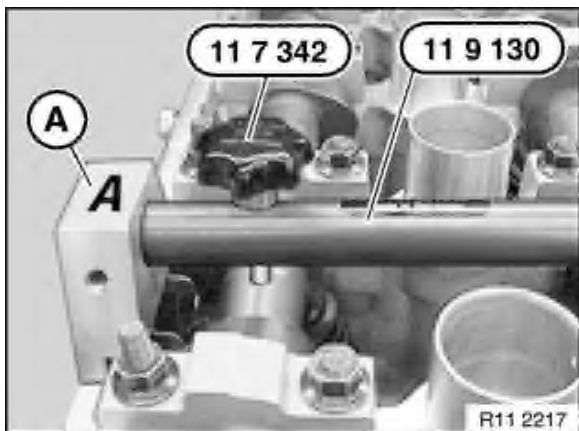
Inlet side:

**Important!**

Pay attention to installation direction of special tool 11 9 130 .

Attach special tool 11 9 130 to cylinder head. Align inlet camshaft at hexagon until special tool 11 7 342 can be joined by means of special tool 11 9 130 in locating bore.

special tool 11 9 130 must rest flat on cylinder head. Remove special tool 11 7 342 .

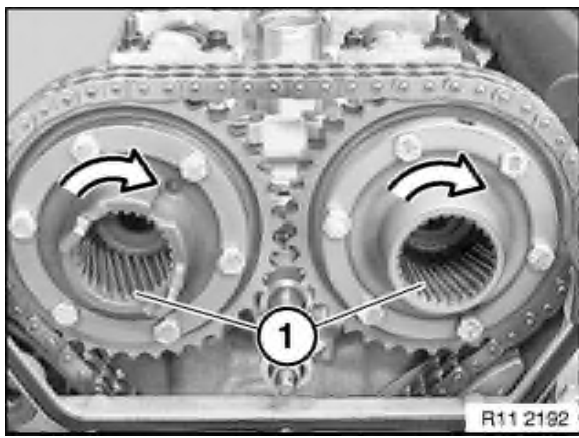


Exhaust side:

Align exhaust camshaft at hexagon until special tool 11 7 342 can be joined by means of special tool 11 9 130 in locating bore.

special tool 11 9 130 must rest flat on cylinder head.

Remove special tool 11 9 130 and special tool 11 7 342 .

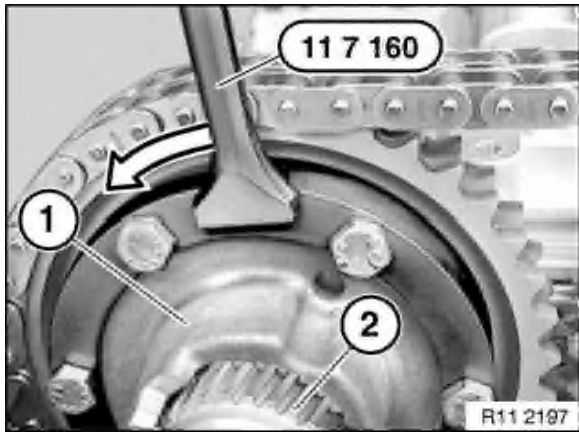


Turn both VANOS gears (1) in direction of arrow up to stop.  
Rotate splined shafts of inlet and exhaust sides until spur tothing is engaged.

**Important!**

Danger of mixing up toothed shafts.

Push VANOS adjustment unit with splined shaft into VANOS gear until helical cut splines (2) are positioned shortly before meshing with spline hub (1).

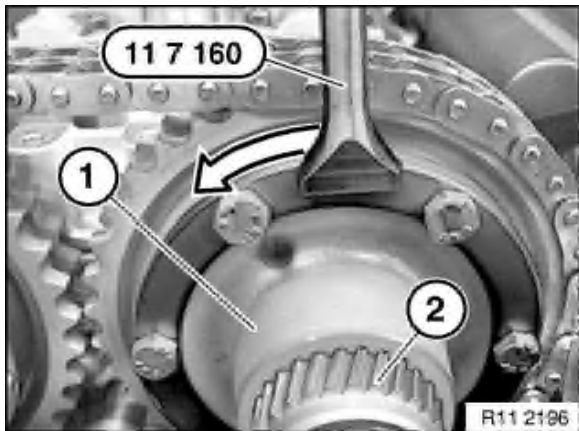


Exhaust side:

If the helical cut splines cannot be pushed into the spline hub (1): Place special tool 11 7 160 on bore in spline hub (1). Rotate spline hub (1) against direction of rotation until splined shaft (2) is positioned with spline hub (1) exactly "tooth-to-tooth gap".

**Important!**

The "first" matching tooth must engage.

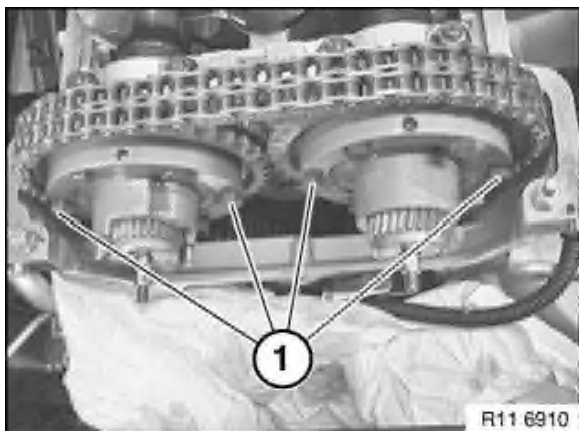


Inlet side:

Place special tool 11 7 160 on bore in spline hub (1). Rotate spline hub (1) against direction of rotation until splined shaft (2) is positioned with spline hub (1) exactly "tooth-to-tooth gap".

**Important!**

The "first" matching tooth must engage.



*Installation:*

The cup springs must be pretensioned so as to obtain a friction torque in the VANOS gears.

**Important!**

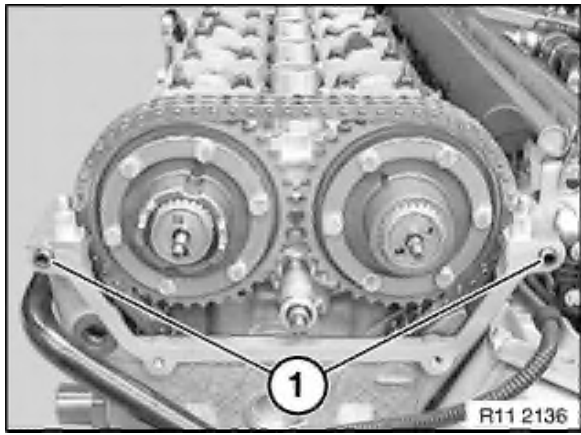
Secure bolts (1) on a single plane only.

Adhere without fail to the procedure described in the following.

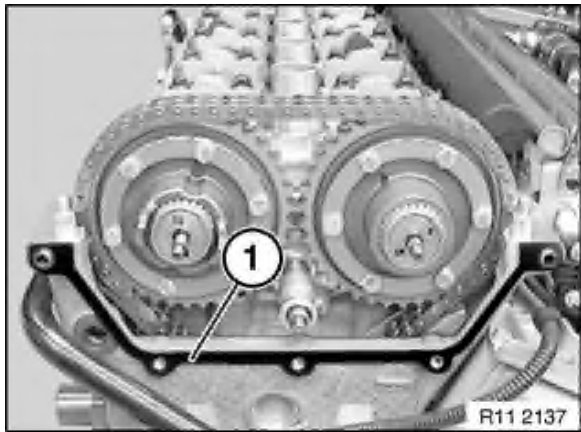
Secure bolts (1) to **10 Nm** .

Before releasing, mark bolts with a coloured marker pen.

Release bolts (1) through **90°**.



Check dowel sleeves (1) for damage and correct installation position.



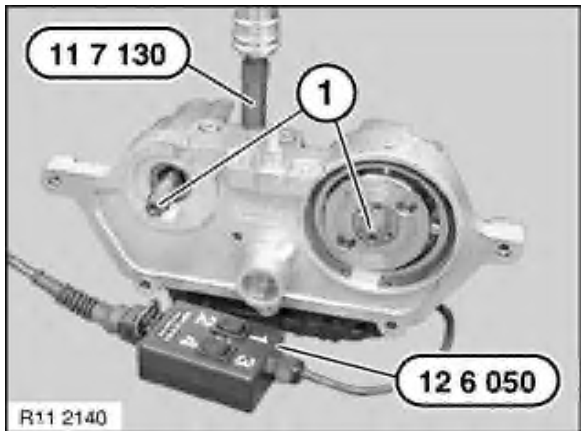
Replace seal (1).

**Important!**

Note direction of installation of gasket.

Install gasket (1) in such a way that beading points to VANOS adjustment unit.

Secure gasket (1) with sealing compound on adapter sleeves.



**E85 only:**

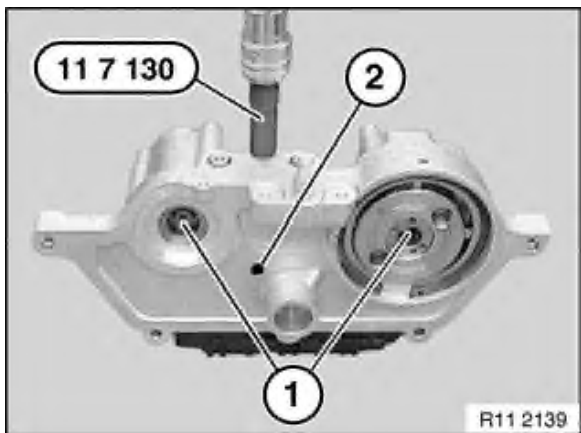
*Installation:*

For installation of VANOS adjustment unit in installed engine.

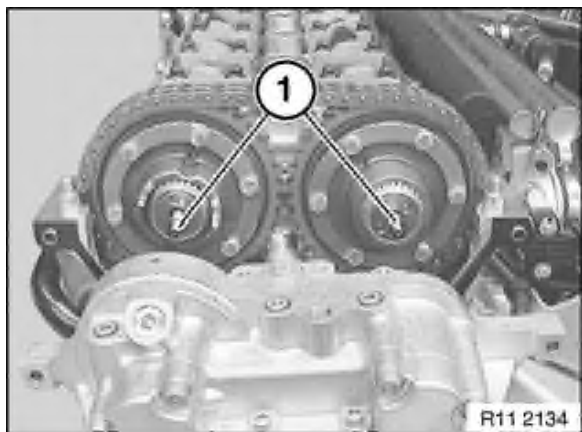
Attach special tool 11 7 130 and connect a compressed air supply of 2 to 8 bar.

Briefly actuate buttons 1 and 3 on special tool 11 6 050.

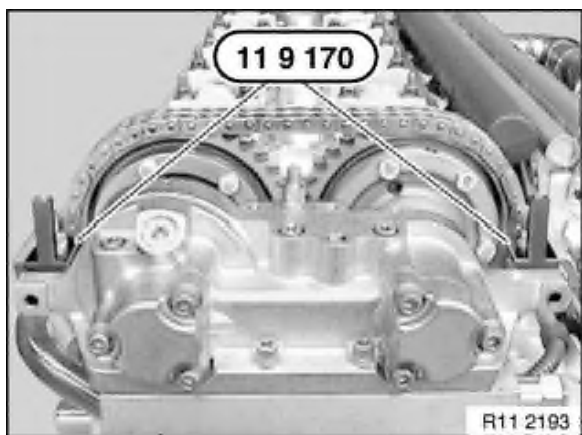
Both axial pistons (1) on VANOS adjustment unit must be retracted (retarded setting).



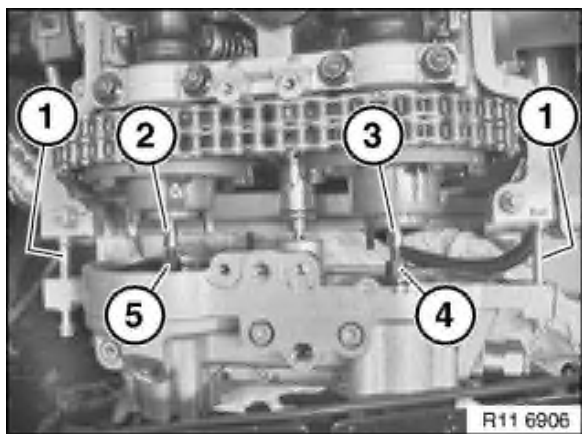
Setting of axial pistons (1) on VANOS adjustment unit.



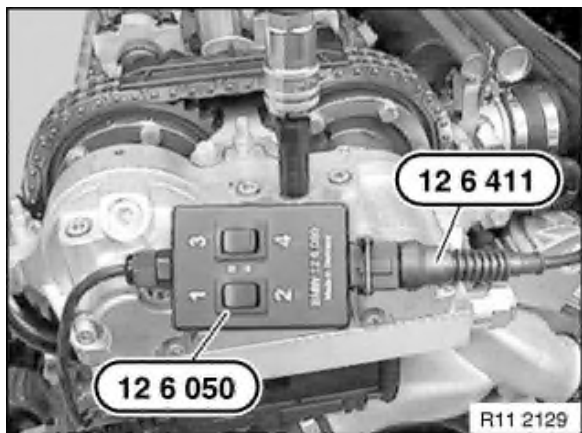
Place VANOS adjustment unit on toothed shafts (1).



Attach special tool 11 9 170 on cylinder head on left and right.



Insert M6x60 bolts (1).



*Installation:*

If the union nuts are not accessible.

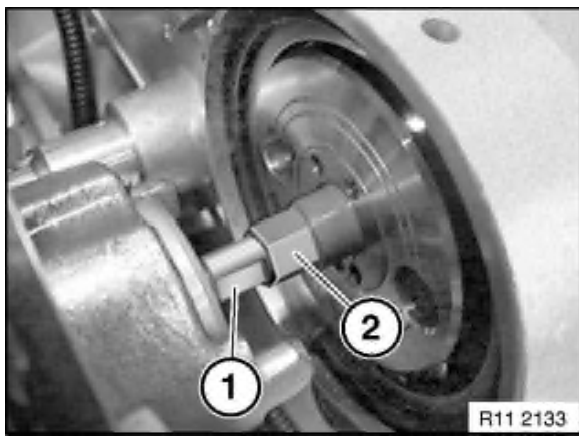
Attach special tool 11 7 130 and connect a compressed air supply of 2 to 8 bar.

Briefly actuate buttons 2 and 4 on special tool 11 6 050 .

Both pistons on the VANOS adjustment unit must now be extended (advanced setting).

**Important!**

**Risk of damage** to the VANOS adjustment unit.



R11 2133

**Important!**

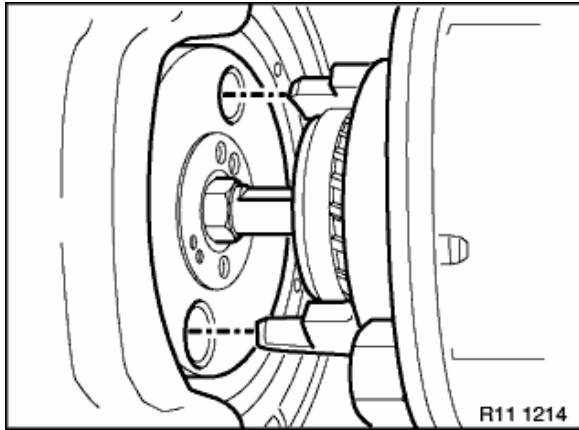
**CCW thread!**

Grip on dihedron (1) and screw in at hexagon (2).

Grip on dihedron (1) and screw together at hexagon (2) alternately between exhaust and inlet sides in 1/2 turn increments.

Secure union nut (2) with special tool 11 7 200 .

Tightening torque **10 Nm** .

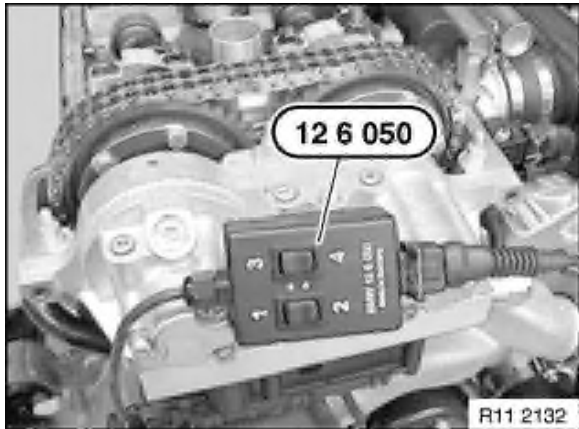


R11 1214

Align radial piston pump to driver on spline hub.

**Note:**

Picture shows a schematic representation.



R11 2132

Press buttons 1 and 3 on special tool 12 6 050

simultaneously. The solenoid valves are activated and the air can escape from the hydraulic pistons of the VANOS adjustment unit.

Simultaneously push on VANOS adjustment unit until it rests on special tool 11 9 170 .

**Important!**

If this position is not reached, check position of radial piston pump to driver and realign if necessary.

Remove two M6x60 bolts.

Remove special tool 11 9 170 .

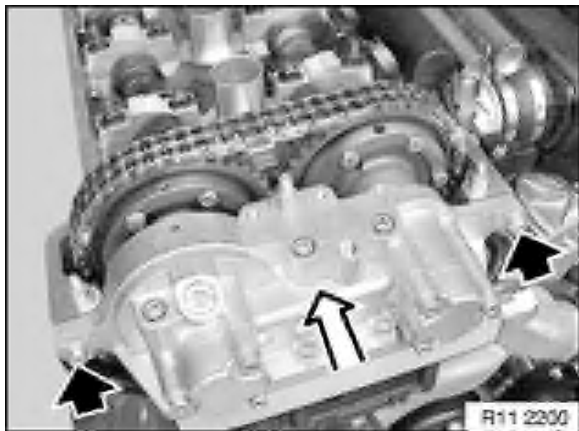
Insert original bolts.

**Important!**

When the left and right screws are tightened down alternately, the exhaust and inlet camshafts must not rotate.

If the camshafts do rotate, this means that the screws on the VANOS gear were not previously released correctly.

Alternately tighten down bolts in 1/2 turn increments carefully and evenly until VANOS adjustment unit rests against timing case cover.



R11 2200



Insert remaining screws and tighten down.

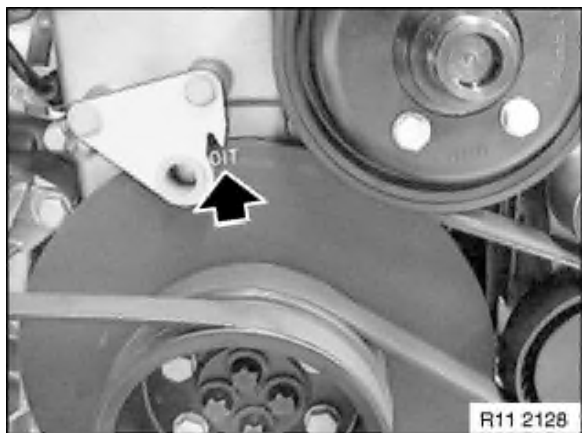


**Note:**

Use special tool 11 7 200 to tighten down bolts on VANOS gear.



Tighten down six accessible screws (three on exhaust side and three on inlet side) on VANOS gear to **14 Nm** .



Remove special tool 11 2 300 or 11 0 480 . Crank engine at central bolt in direction of engine rotation a further revolution up to **cylinder 1 overlap TDC position** .

**Note:**

TDC allocation above marking on vibration damper is sufficient.

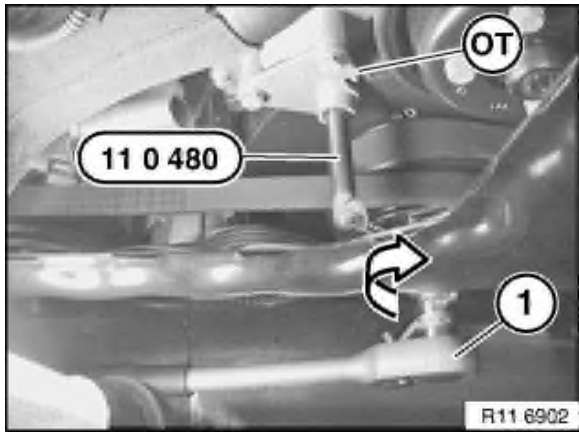




**Note:**

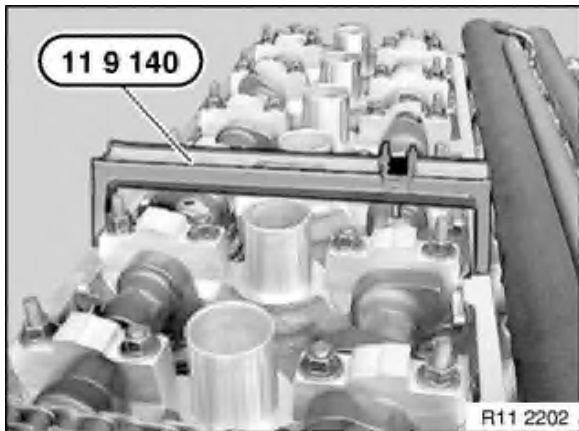
Use special tool 11 7 200 to tighten down bolts on VANOS gear.

Tighten down remaining six screws (three on exhaust side and three on inlet side) on VANOS gear to **14 Nm**.



Crank engine in direction of engine rotation up to **cylinder 1 firing TDC position**.

Locate vibration damper with special tool 11 2 300 or 11 0 480.



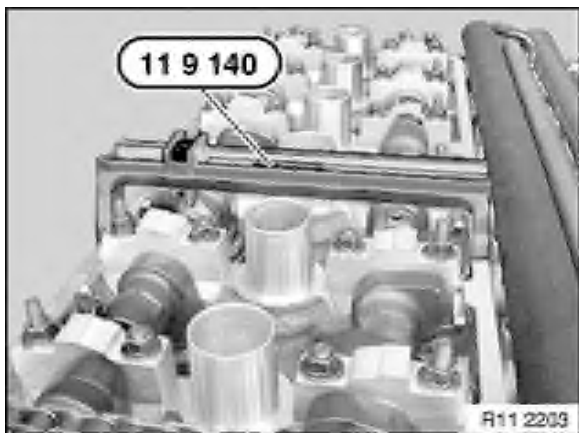
Check camshaft setting:

Attach special tool 11 9 140 and join in inlet camshaft.

*Note:*

The adjustment of the inlet camshaft is correct when special tool 11 9 140 rests flat on the cylinder head.

If the special tool 11 9 140 protrudes to the inlet side, the timing must be readjusted.



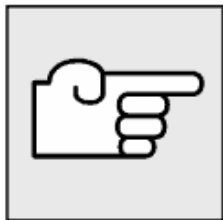
Join special tool 11 9 140 in exhaust camshaft.

*Note:*

The adjustment of the exhaust camshaft is correct when special tool 11 9 140 rests flat on the cylinder head.

If the special tool 11 9 140 protrudes to the inlet side, the timing must be readjusted.





Assemble engine.

There is air in the VANOS system once it is opened.

In the first few seconds after startup this results in a clearly discernible "rattling noise".

This rattling noise does "not" indicate incorrect assembly.

The rattling noise will disappear as soon as the oil pressure has built up and the system has vented.

Perform VANOS test.