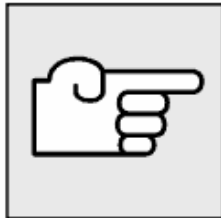
**Special tools required:**

- 11 5 100
- 11 7 130
- 12 6 050
- 12 6 410
- 12 6 411

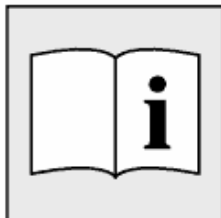
Read fault memory and make a documentary record.



Remove cylinder head.

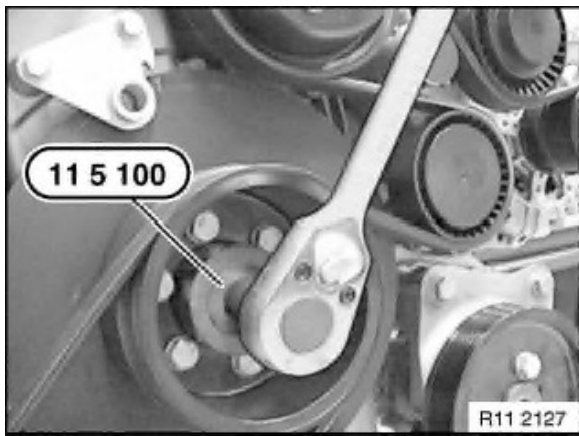
Remove all spark plugs.

Remove fan clutch with fan impeller and fan cowl.

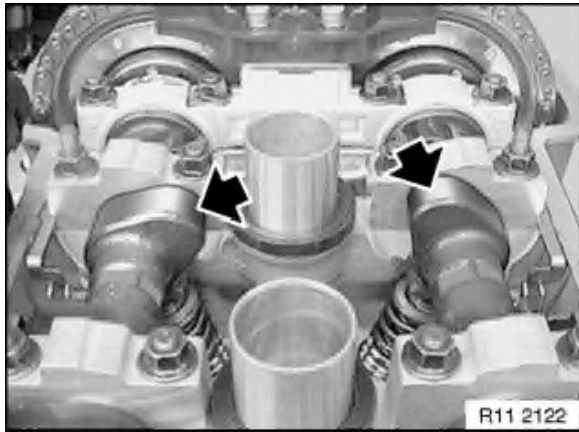
**Removal**

The removal of the VANOS adjustment unit is described separately from the installation. The assembly sequence for removal and installation is different.

Fit special tool 11 5 100 to four screws on crankshaft hub.

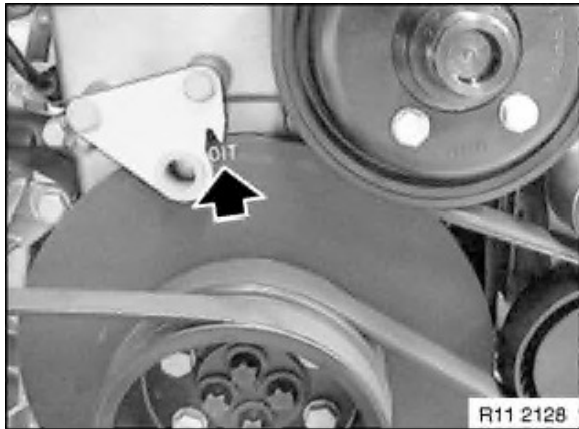


Rotate crankshaft in direction of rotation as far as firing TDC position of 1st cylinder.



**Note:**

TDC allocation above marking on vibration damper is sufficient.



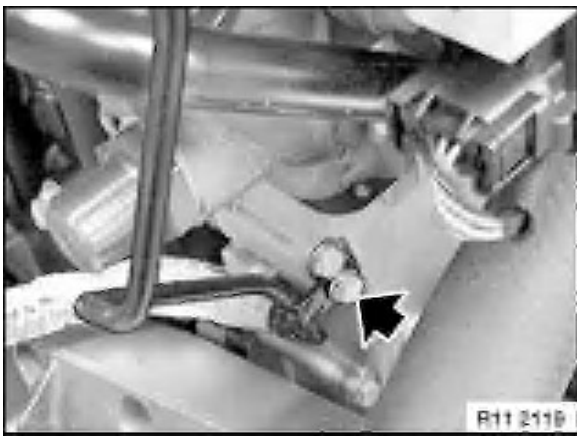
**Caution!**

When the engine is switched off, VANOS moves the camshafts to a position which is advantageous to engine starting.

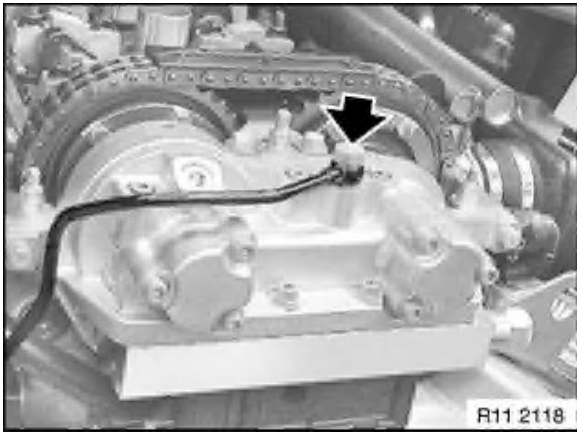
The camshafts and the VANOS adjustment unit must be placed in the installation position before the VANOS adjustment unit is removed.



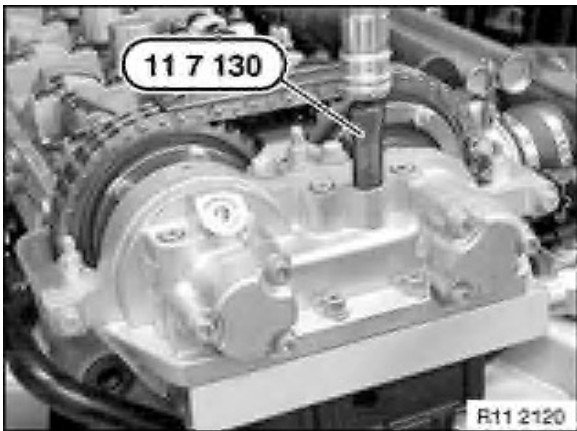
Detach bracket of oil line from timing case cover.



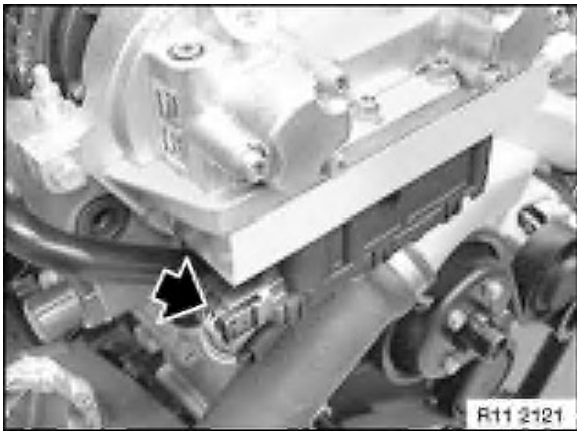
Remove oil line from VANOS adjustment unit.

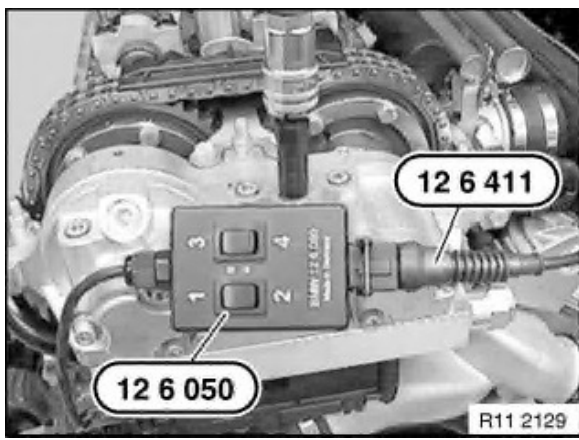


Fit special tool 11 7 130 to VANOS adjustment unit.  
Connect compressed air (2 to 8 bar).



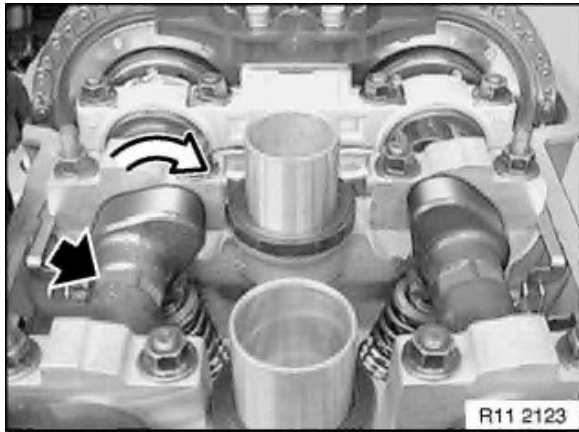
Disconnect plug connection on solenoid valve.





Connect special tool 12 6 050 in conjunction with special tool 12 6 411 (from special tool kit 12 6 410 ) to solenoid valves. Connect special tool 12 6 411 to correct terminals on car battery.

Alternately press toggle switch buttons 1 and 2 several times on special tool 12 6 050 .

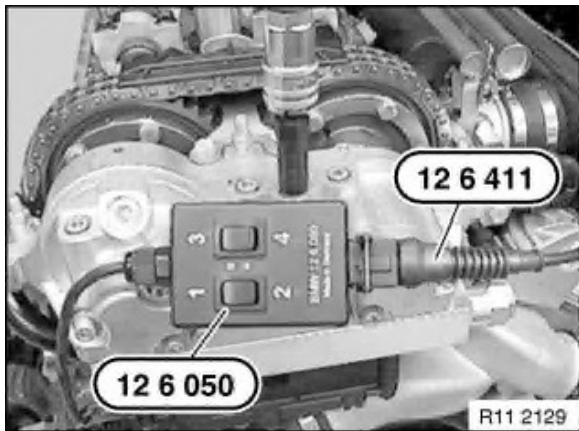


Press and hold down toggle switch button 1 on special tool 12 6 050 .

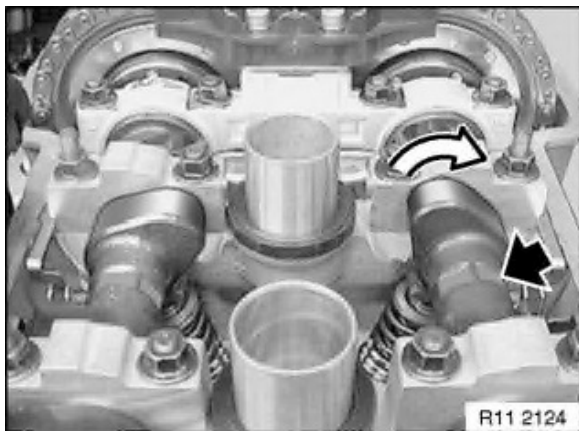
At same time, rotate inlet camshaft at hexagon drive against direction of rotation as far as it will go.

**Note:**

Spline teeth in VANOS gear are engaged; and inlet camshaft cannot be rotated further.



Alternately press toggle switch buttons 3 and 4 several times on special tool 12 6 050 .



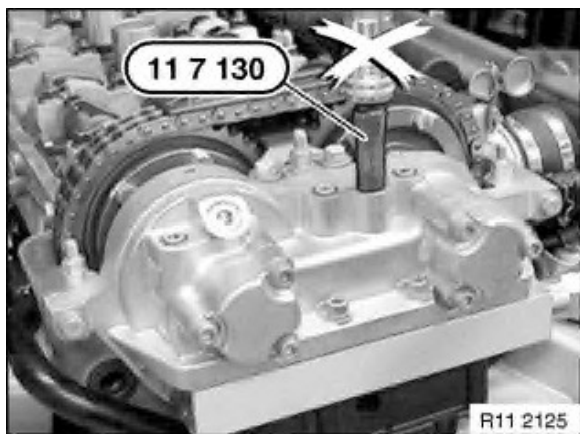
Press and hold down toggle switch button 3 on special tool 12 6 050 .

At same time, rotate exhaust camshaft at hexagon drive against direction of rotation as far as it will go.

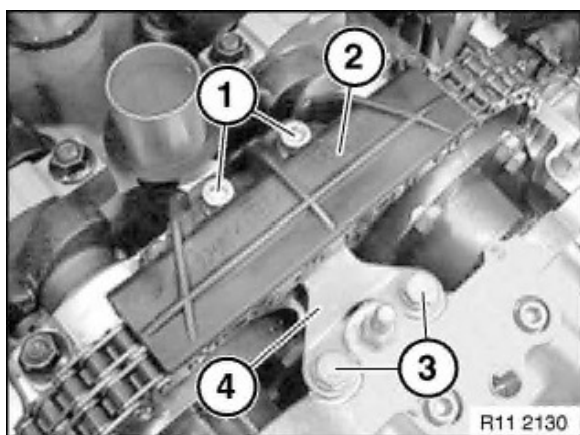
**Note:**

Spline teeth in VANOS gear are engaged; and exhaust camshaft cannot be rotated further.

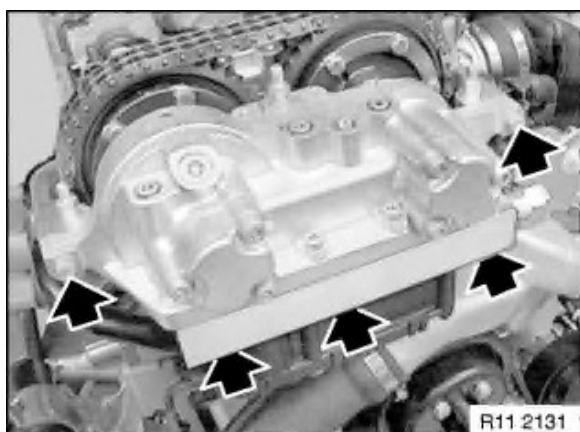
Disconnect compressed air from special tool 11 7 130 .



- Release screws (1).
- Remove sliding rail (2).
- Release screws (3).
- Remove holder (4).



Release screws on VANOS adjustment unit.



**Caution!**

Make sure that compressed air is "not" connected.

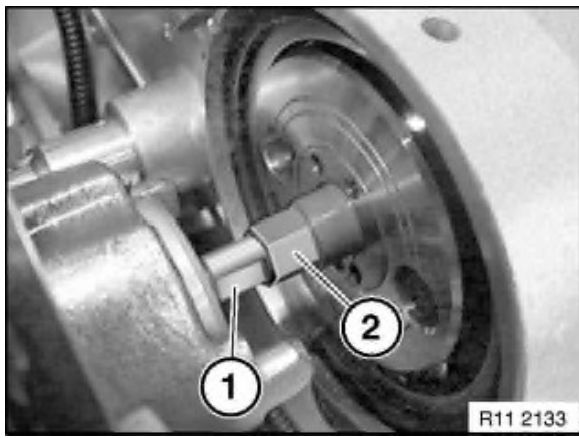
Press buttons 2 and 4 on special tool 12 6 050 . The solenoid valves are activated and the oil chamber of the hydraulic piston is ventilated.

**Caution!**

Do not damage VANOS adjustment unit.

Carefully detach VANOS adjustment unit from adapter sleeves in cylinder head.





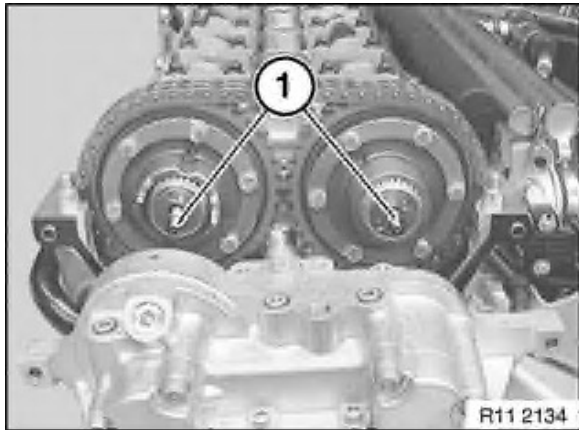
Detach VANOS adjustment unit until hydraulic pistons on exhaust and inlet sides are extended.

**Caution!**

CCW thread!

Brace against twin surface (1) and release hex head (2).

Release screw connection of toothed shaft on inlet and exhaust sides, supporting VANOS adjustment unit with your hand in the process.



Remove VANOS adjustment unit.

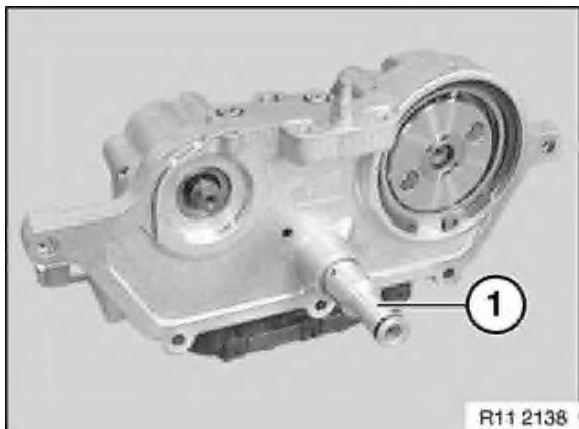
**Note:**

The toothed shafts (1) remain in the VANOS gear on the engine.

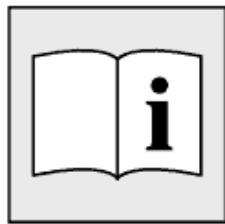


**Caution!**

The engine must not be cranked while the VANOS adjustment unit is removed. The toothed shafts might displace and slip out of the spline teeth; the camshafts would no longer be non-positively connected and the valves could touch the piston.

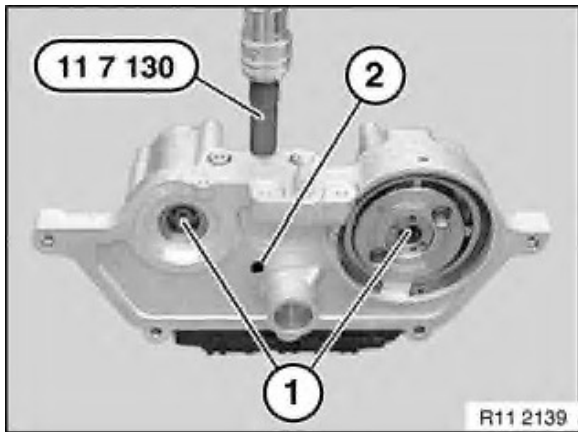


Detach control valve (1) from VANOS adjustment unit.



## Installation

The installation of the VANOS adjustment unit is described separately from the removal. The assembly sequence for removal and installation is different.



### Note:

Procedure for replacement or new parts:

When delivered, the hydraulic pistons (1) of the VANOS adjustment unit are "retracted" and the hexagons are not accessible.

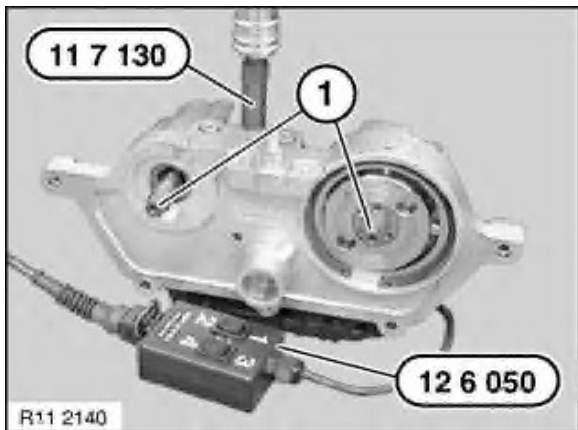
Fit special tool 11 7 130 to VANOS adjustment unit.

### Caution!

Oil is sprayed when compressed air is connected.

Cover bore (2) with a cloth.

Connect compressed air (2 to 8 bar).

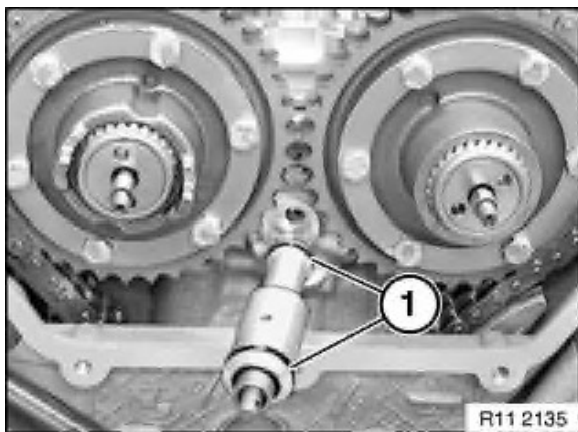


Connect special tool 12 6 050 in conjunction with special tool 12 6 411 to solenoid valves of VANOS adjustment unit.

Connect special tool 12 6 411 to correct terminals on car battery.

Press buttons 2 and 4 on special tool 12 6 050. The solenoid valves are activated and the oil chamber of the hydraulic piston is ventilated. The hydraulic pistons (1) extend.

Disconnect compressed air from special tool 11 7 130.  
Remove special tool 11 7 130 from VANOS adjustment unit.



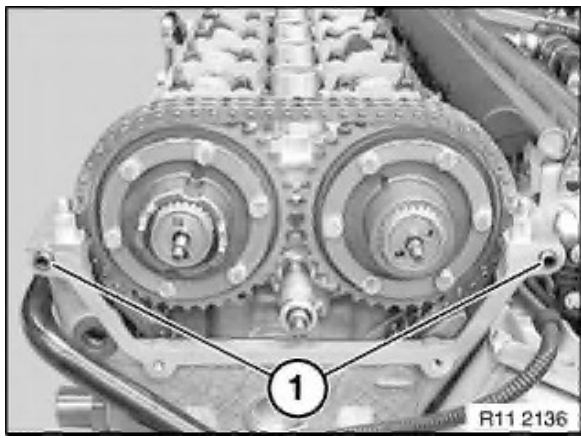
### Note:

A filter is integrated in the control valve.

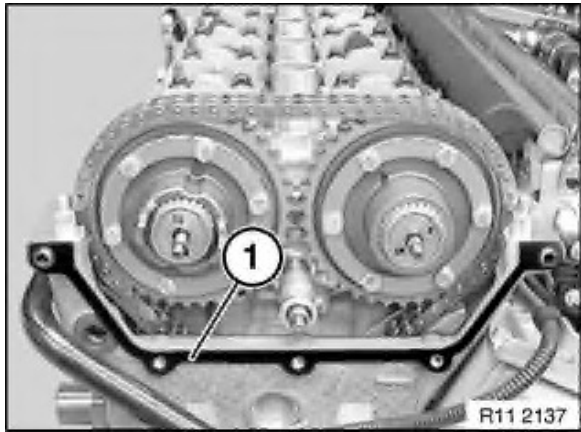
In the event of engine damage which suggests that the filter is contaminated with swarf/chips, it is essential to replace the control valve.

Replace sealing rings (1) and coat with oil as antiseize agent.

Preassemble control valve in cylinder head.



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



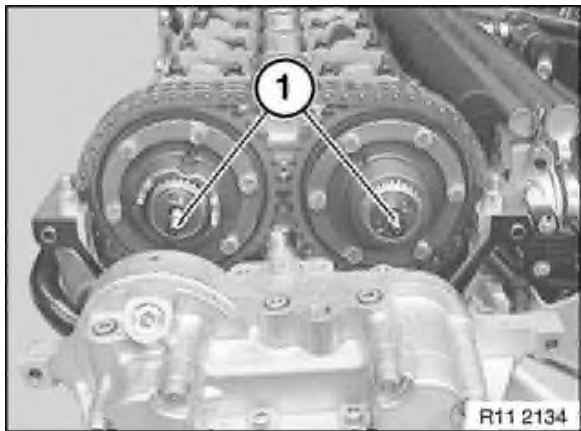
Replace gasket (1).

**Caution!**

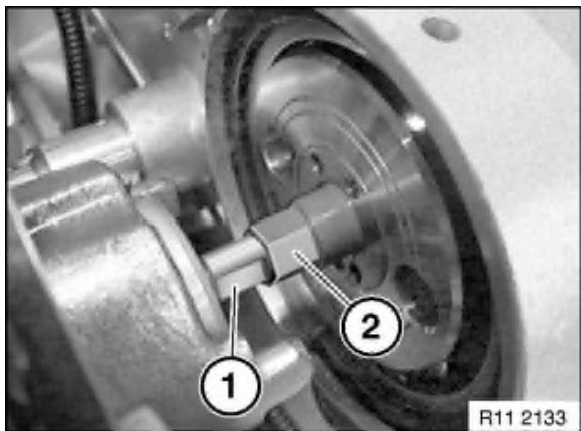
Note direction of installation of gasket.

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

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



Place VANOS adjustment unit on toothed shafts (1).



**Caution!**

CCW thread!

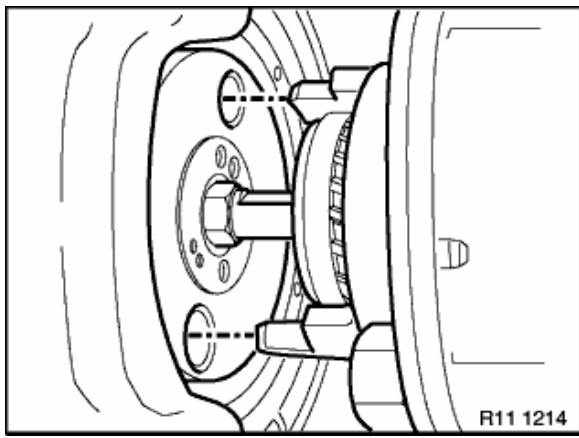
When tightening down toothed shafts, support VANOS adjustment unit with your hand.

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

Tighten down screw connection of toothed shaft on inlet and exhaust sides.

Tightening torque 10 Nm.

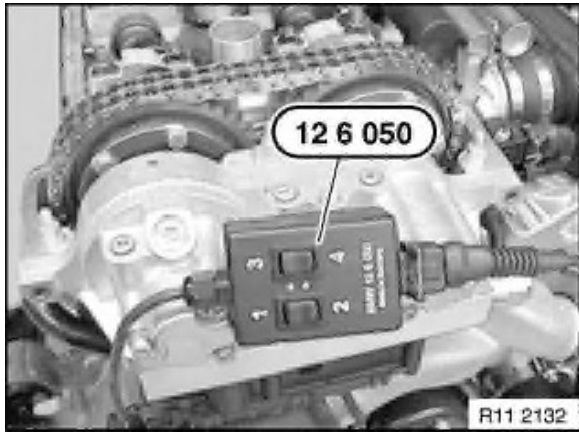




Align radial piston pump to driver on spline hub.

**Note:**

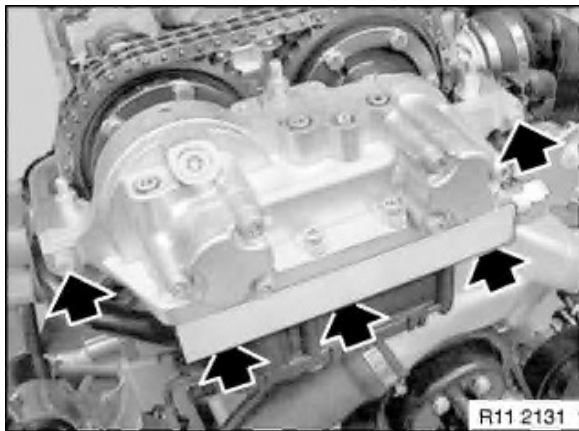
Picture shows a schematic representation.



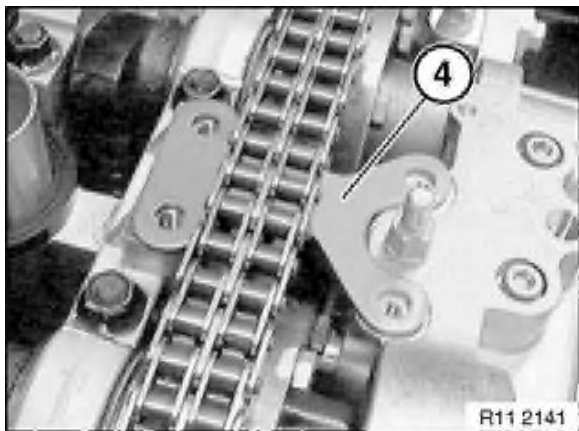
Press buttons 1 and 3 on special tool 12 6 050 simultaneously. The solenoid valves are activated and the air can escape from the hydraulic pistons of the VANOS adjustment unit. Simultaneously push on VANOS adjustment unit until it rests on cylinder head.

**Caution!**

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



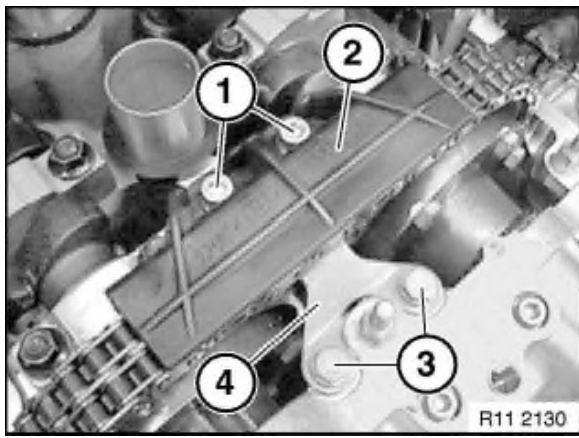
Insert screws of VANOS adjustment unit and tighten down.



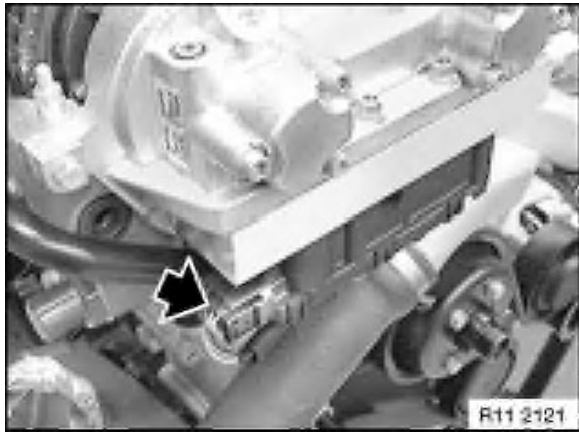
*Note:*

Check installed direction.

Install holder (4).

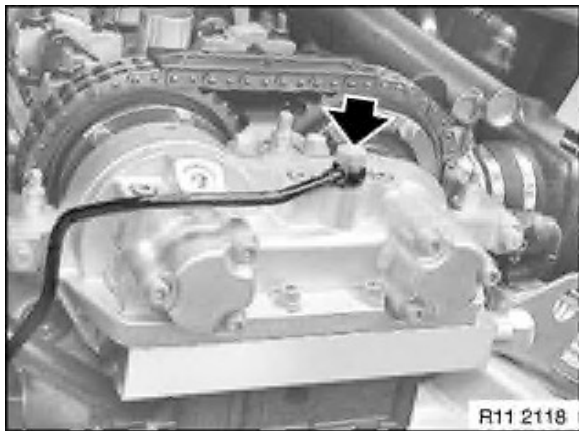


- Insert screws (3) and secure holder (4) (do not tighten down screws (3) yet)
- Install sliding rail (2).
- Insert screws (1).
- Tighten down screws (1) and screws (3).



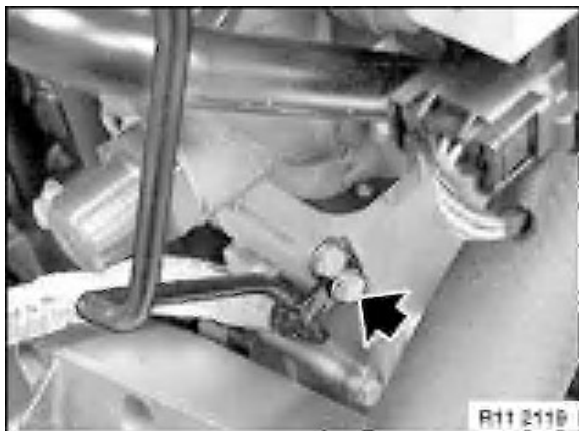
Disconnect special tool 12 6 050 and special tool 12 6 410 and remove.

Insert screw connections in solenoid valves.

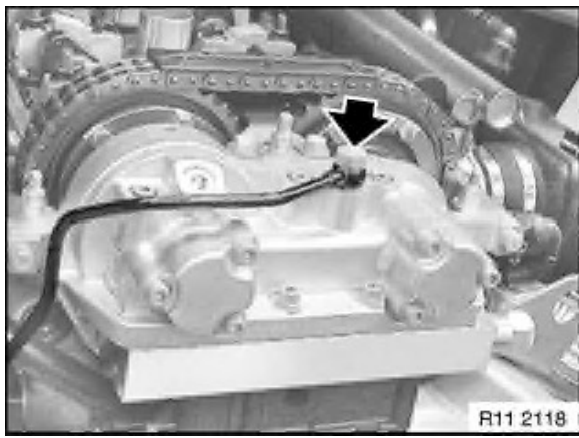


Replace sealing rings of banjo bolt.

Insert banjo bolt but do not tighten down yet.



Install bracket of oil line. Install screw and tighten down.



Tighten down banjo bolt of oil line.  
Tightening torque, 11 36 9AZ.  
Assemble engine.



**Caution!**

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.