

**Caution!**

When the engine is switched off, VANOS moves the camshafts to a position which is advantageous to engine starting. The camshaft timing is "not" permitted to be adjusted in this position. The camshafts must be turned back to their initial position.

The preliminary work is described in the work step dealing with checking camshaft timing, refer to 11 31 005

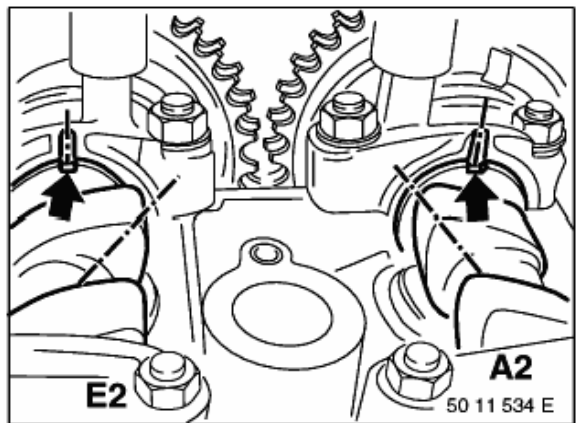
**Note:**

If a fault is identified during the preliminary work of checking camshaft timing, remove the VANOS adjustment unit and readjust the camshafts.

**Caution!**

The special tools for checking and adjusting the timing are different.

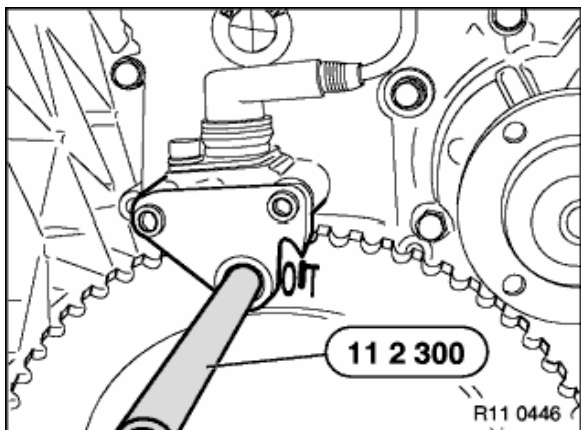
Instructions for removing the VANOS adjustment unit, adjusting the camshafts and installing the VANOS adjustment unit are given below.

**Note:**

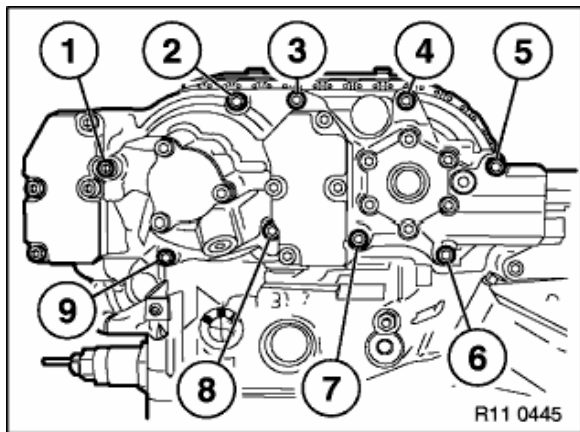
The engine is at the TDC firing position of the first cylinder.

The cam tips of the exhaust and intake camshafts point to each other.

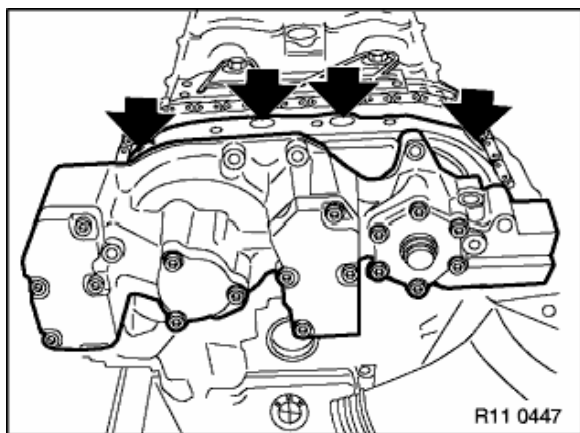
The grooves in the exhaust and intake camshafts point to the grooves in the first bearing cover.



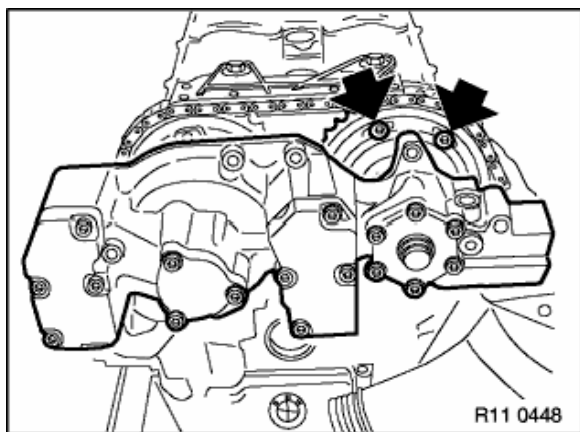
Remove special tool 11 2 300.



Unfasten screws (1 ... 9) from VANOS adjustment unit.

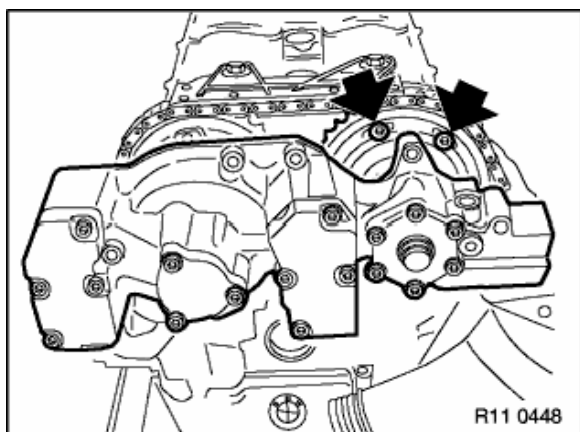


Unscrew end cover (VANOS bridge) on timing case.



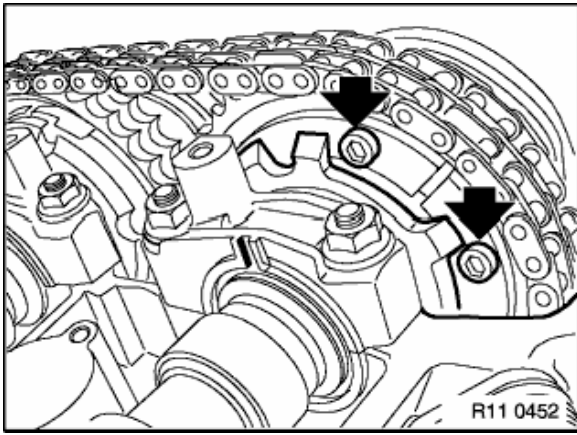
**Caution!**

Do "not" slacken the two screws that are now accessible at the intake end of the VANOS gear.

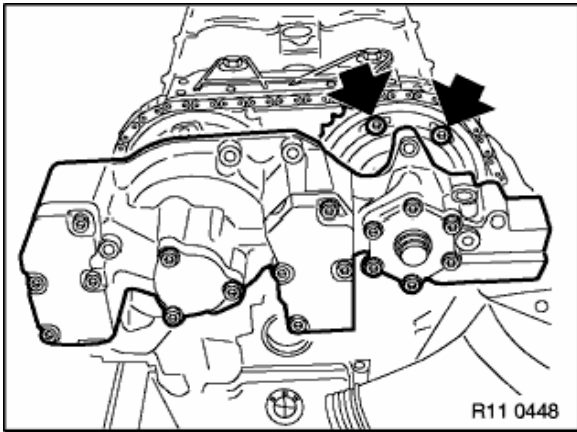


Continue to rotate crankshaft in direction of rotation until the next two screws on the VANOS gear are accessible.

Now unfasten the two screws accessible on the intake end of the VANOS gear approx. two complete turns.

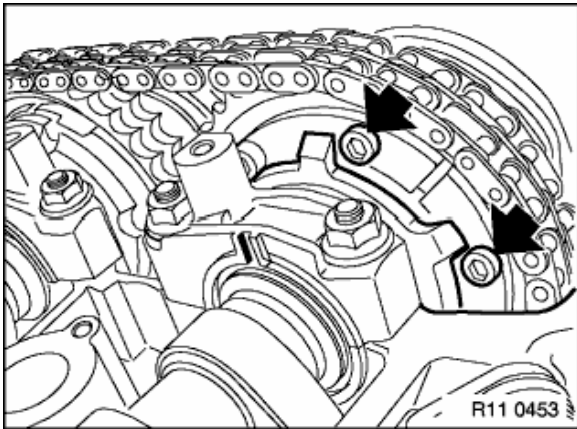


Now unfasten the two screws accessible on the exhaust end of the VANOS gear approx. two complete turns.

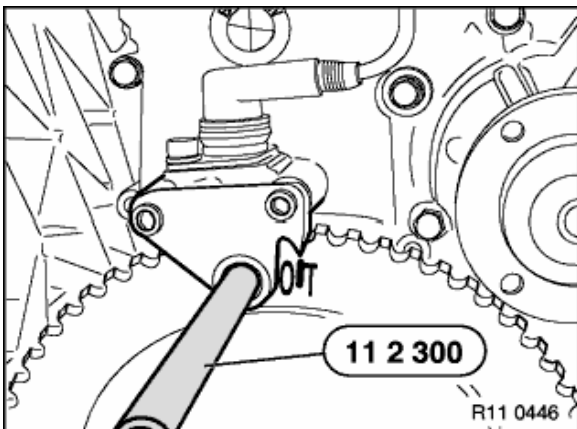


Continue to rotate crankshaft in direction of rotation until the next two screws on the VANOS gear are accessible.

Now unfasten the two screws accessible on the intake end of the VANOS gear approx. two complete turns.

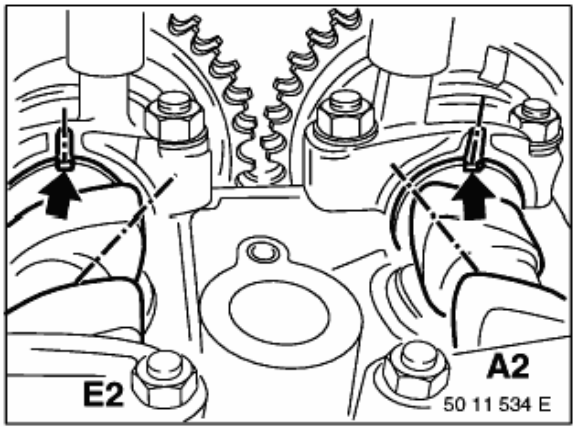


Now unfasten the two screws accessible on the exhaust end of the VANOS gear approx. two complete turns.



Turn engine in direction of rotation as far as TDC firing position of first cylinder.

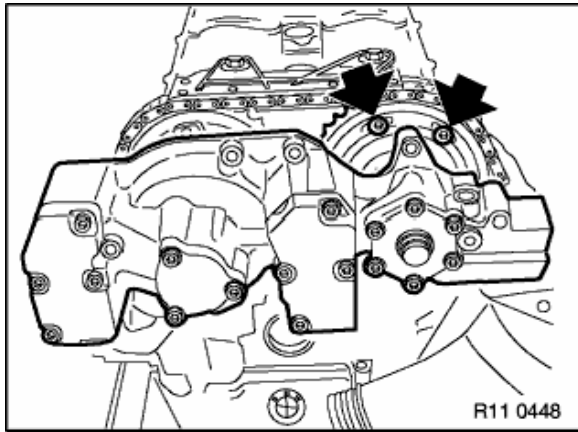
Secure vibration damper with special tool 11 2 300.



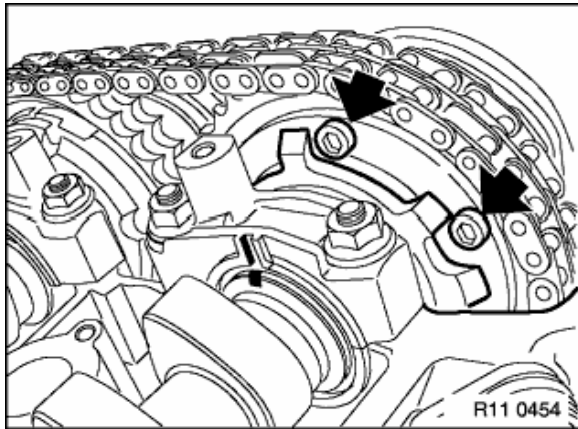
**Note:**

The cam tips of the exhaust and intake camshafts point to each other.

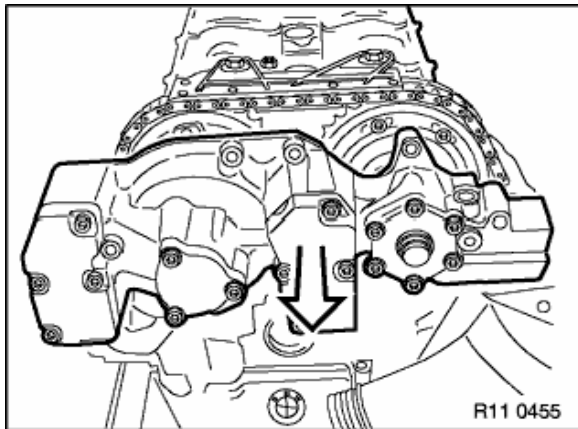
The grooves in the exhaust and intake camshafts point to the grooves in the first bearing cover.



Now unfasten the two screws accessible on the intake end of the VANOS gear approx. two complete turns.



Now unfasten the two screws accessible on the exhaust end of the VANOS gear approx. two complete turns.

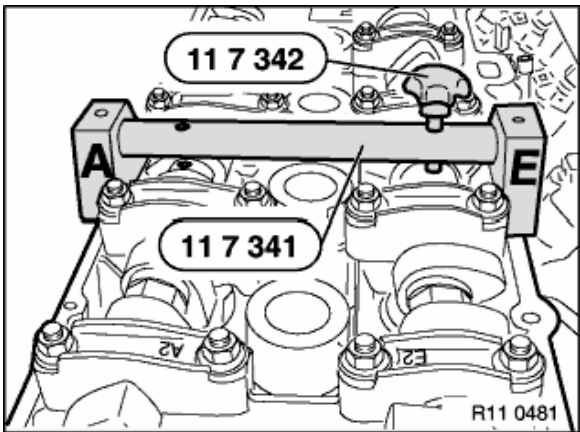


Dismantle VANOS adjustment unit and remove.



### Caution!

On removed VANOS adjustment unit, sprockets on intake and exhaust camshafts are not positively linked to the camshafts. To prevent valves making contact with pistons, the crankshaft must not be rotated in this condition.

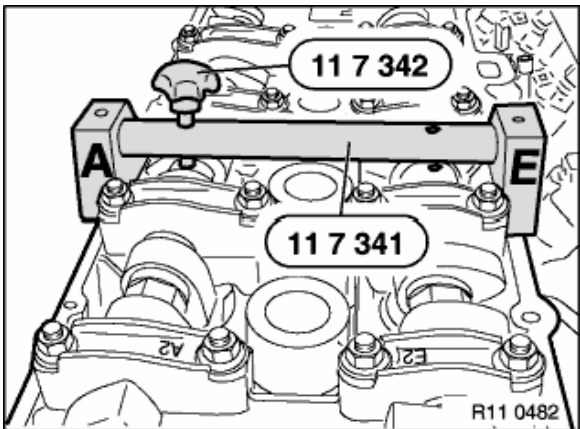


### Caution!

Note direction of installation of special tool 11 7 341.

Fit special tool 11 7 341 / 342 to intake camshaft.

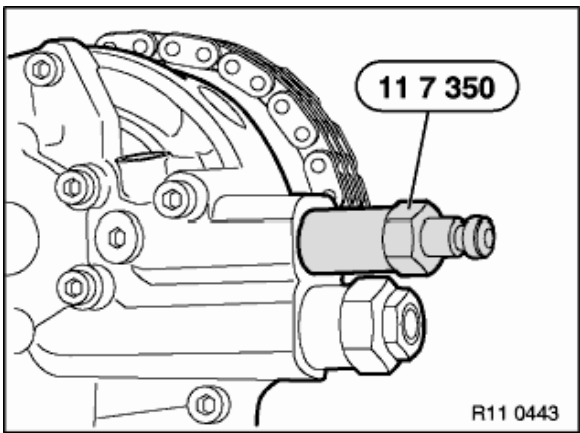
Align intake camshaft at hex head until special tool 11 7 341 is flush against timing case.



Insert special tool 11 7 342 into exhaust camshaft.

Align exhaust camshaft at hex head until special tool 11 7 341 is flush against timing case.

Remove special tool 11 7 341 / 342.

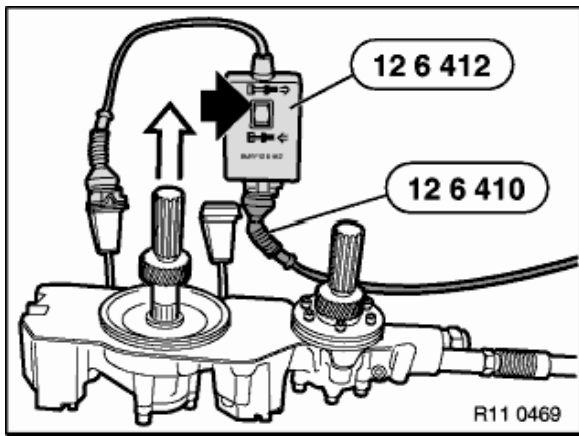


Fit special tool 11 7 350 to the removed VANOS adjustment unit.

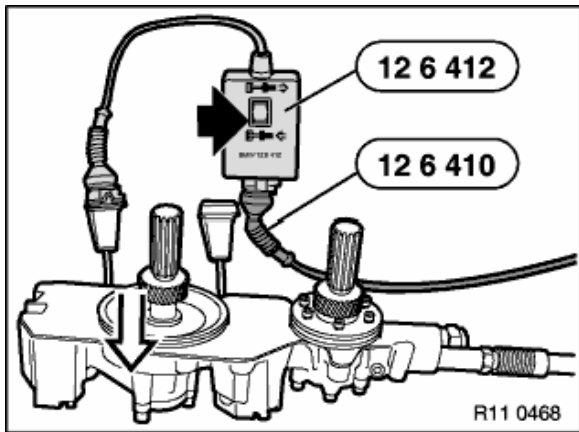
### Caution!

Cover VANOS adjustment unit. Oil may be sprayed when compressed air is connected up and when the solenoid valves are actuated.

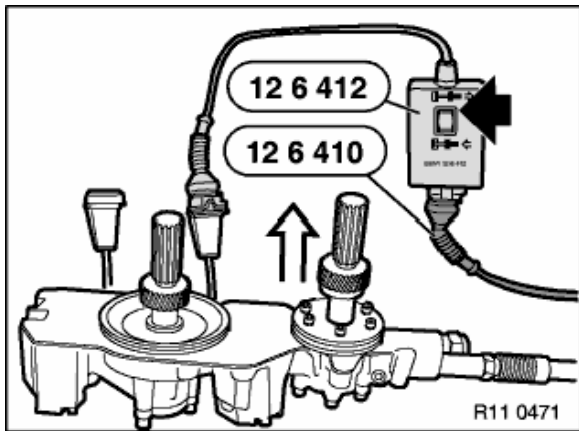
Connect up compressed air (2 ... 8 bar).



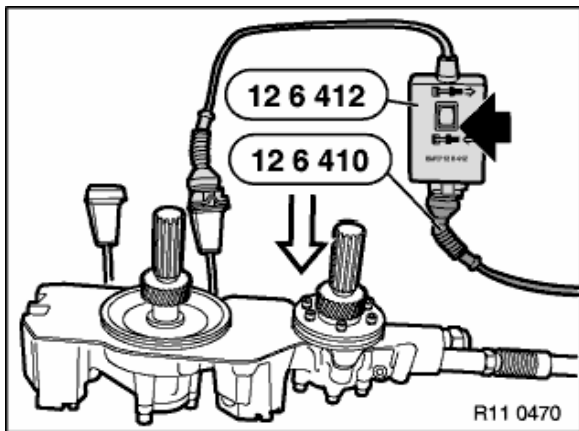
Check switching operation of solenoid valves:  
 Connect special tools 12 6 412 and 12 6 410 to the solenoid valves on the exhaust end.  
 Connect special tool 12 6 410 to correct terminals on vehicle battery.  
 Press toggle switch on special tool 12 6 412 to extend VANOS splined shaft.  
 Splined shaft extends with hydraulic piston.



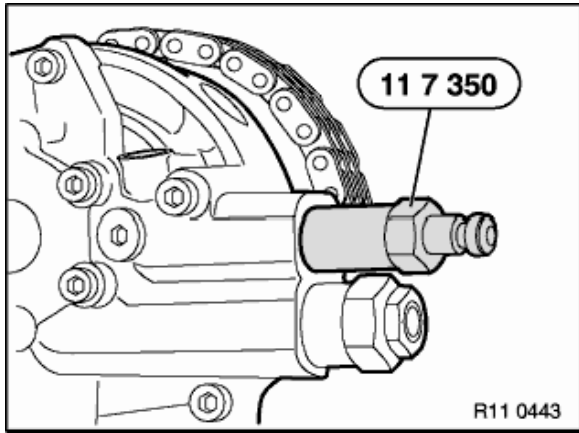
Press toggle switch on special tool 12 6 412 into position for retracting VANOS splined shaft.  
 Splined shaft retracts on hydraulic piston (initial setting).



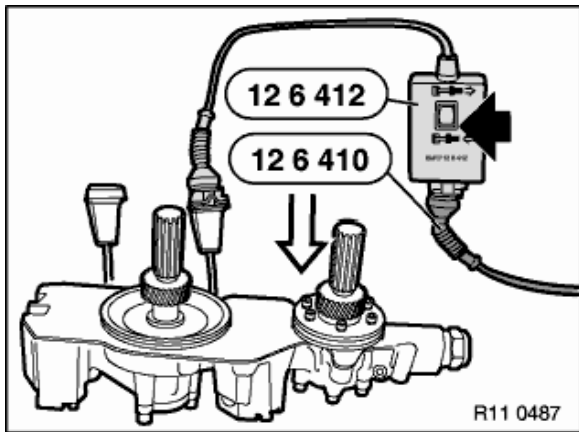
Connect special tool 12 6 412 to plug connection for solenoid valves on intake end.  
 Press toggle switch on special tool 12 6 412 to extend VANOS splined shaft.  
 Splined shaft extends with hydraulic piston.



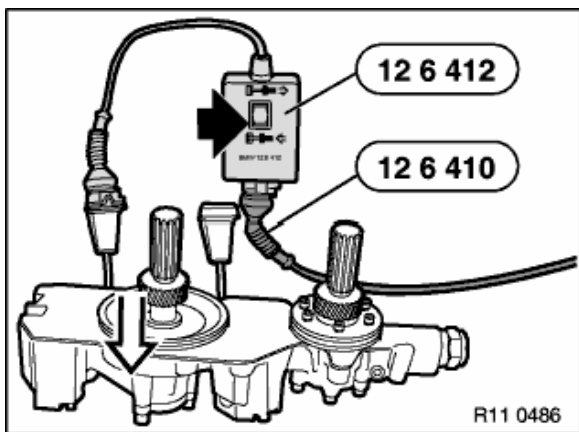
Press toggle switch on special tool 12 6 412 into position for retracting VANOS splined shaft.  
 Splined shaft retracts on hydraulic piston (initial setting).



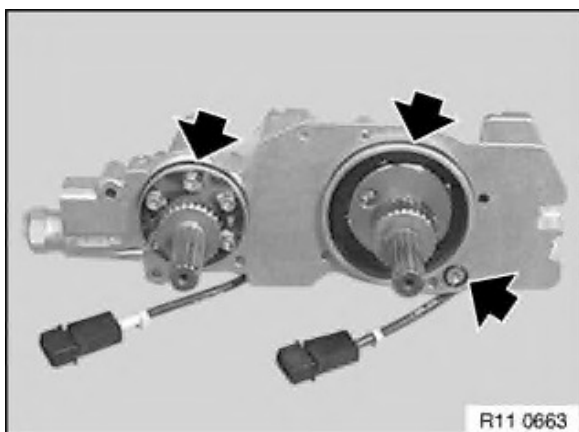
Disconnect compressed air.  
Remove special tool 11 7 350.



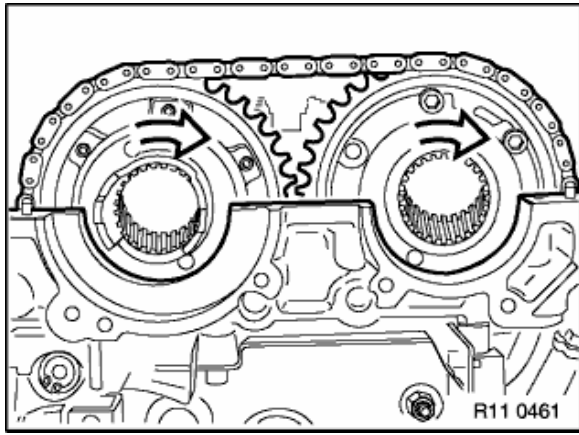
Press toggle switch on special tool 12 6 412 into position for retracting VANOS splined shaft.  
Hydraulic piston is vented.  
At the same time, press splined shaft and hydraulic piston back into initial position by hand.



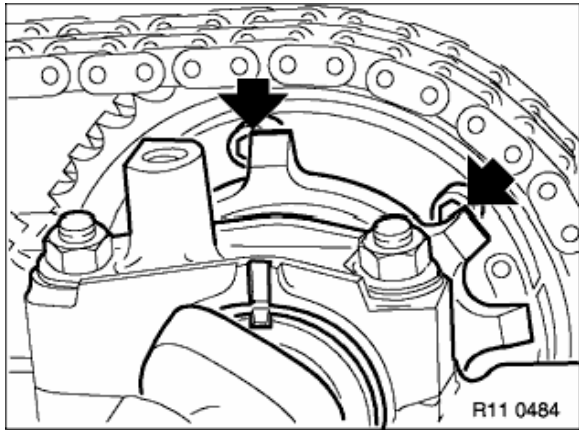
Connect special tool 12 6 412 to the solenoid valves on the exhaust end.  
Press toggle switch on special tool 12 6 412 into position for retracting VANOS splined shaft.  
Hydraulic piston is vented.  
At the same time, press splined shaft and hydraulic piston back into initial position by hand.  
Disconnect special tools 12 6 412 and 12 6 410 from the solenoid valves.



Replace sealing rings.



Turn splined hubs on intake and exhaust camshafts to right limit position.

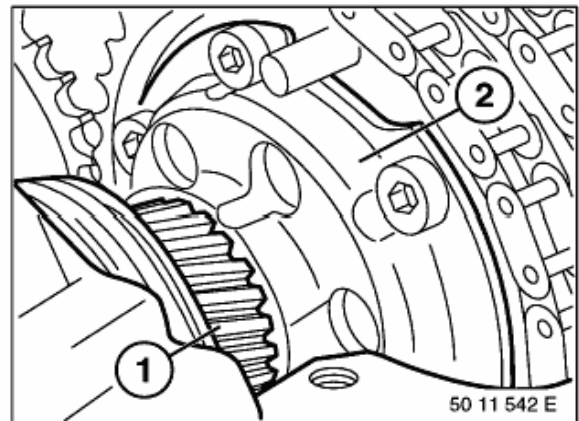


**Note:**

On right detent of tooth hub, screws on VANOS- gear must be at least half and no more than three quarters below vanes on impeller.

Left side of screw head can be seen.

If this position is not reached, the screw heads are no longer accessible after installation of the VANOS adjustment unit; if necessary, remove and reposition chain wheel. This task is described in the work step dealing with replacing camshafts, refer to 11 31 019 (S50 B32)



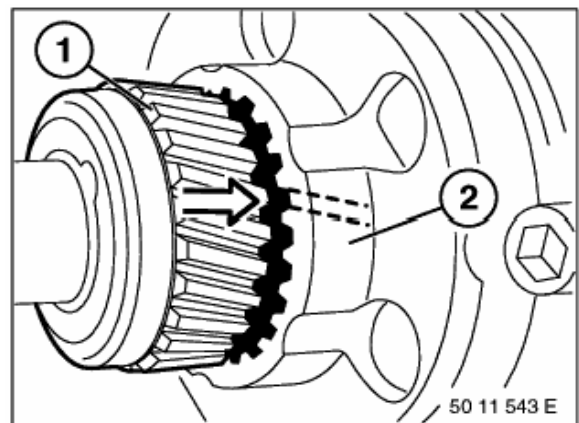
**Caution!**

Ensure that both VANOS splined shafts remain in initial position during assembly procedure.

Insert VANOS adjustment unit with splined shaft on exhaust end into VANOS gear until helical gear (1) almost locates in splined hub (2).

**Note:**

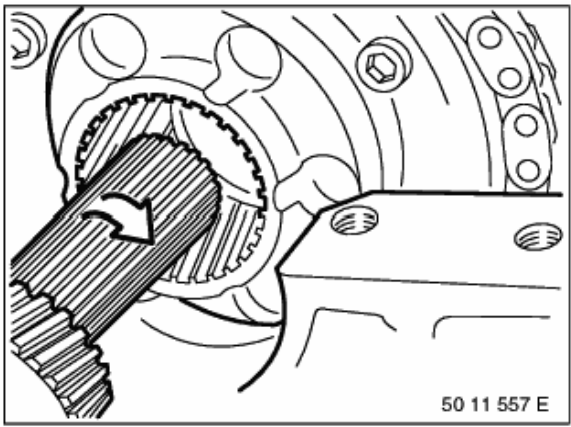
Spur gear on splined shaft is already in mesh with the exhaust camshaft.



Check whether bevel splines of splined shaft (1) are precisely aligned "tooth to tooth gap" with splined hub (2).

If it proves impossible to insert the physical gear in the splined hub, retract VANOS adjustment unit with splined shaft until spline can rotate freely.





Select a new tooth position by turning splined shaft.

**Caution!**

Before fitting VANOS adjustment unit again, always press splined shaft back into initial position.

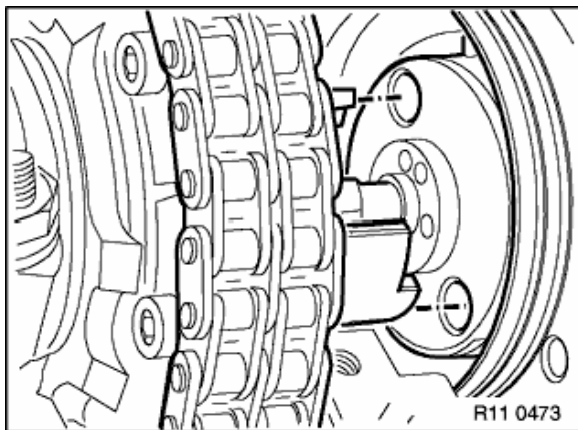
Repeat operation until helical gear engages in splined hub.

Repeat procedure on the intake end.

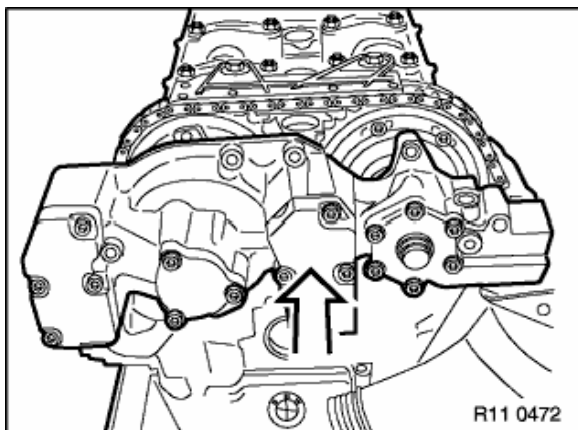
**Note:**

The splined shaft on the intake end is always approx. 5 mm shorter.

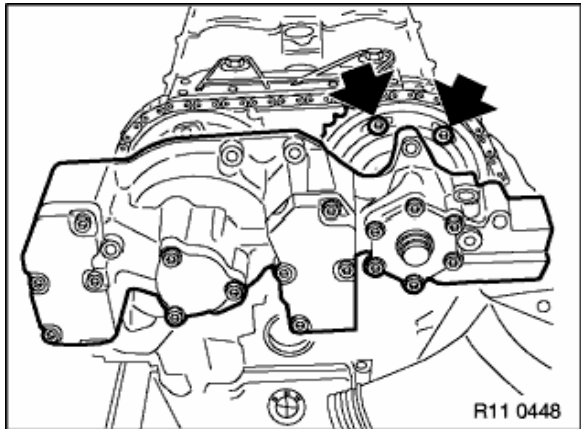
If a new spline setting has to be sought on the intake end, retract VANOS adjustment unit just far enough to leave exhaust end in mesh.



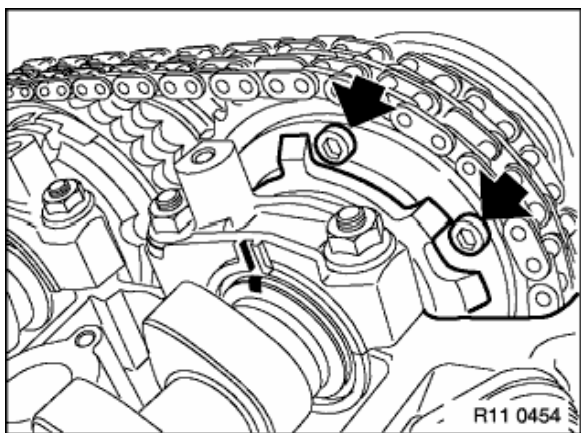
On the exhaust end, align radial piston pump with driver on splined hub.



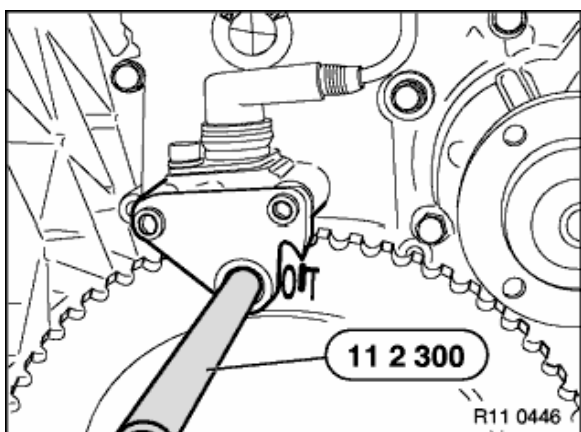
Insert VANOS adjustment unit as far as timing case and secure to timing case with two screws.



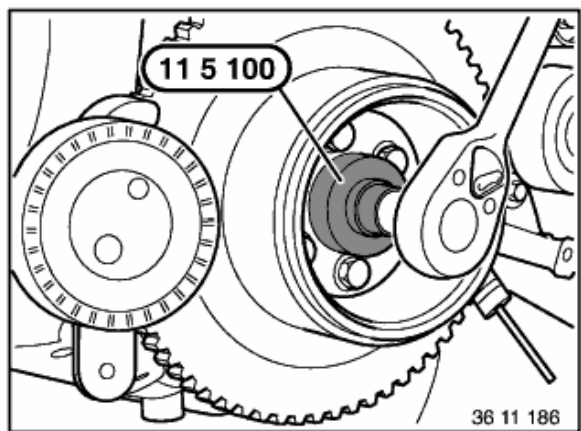
Tighten down the accessible two screws on the intake end of the VANOS unit.



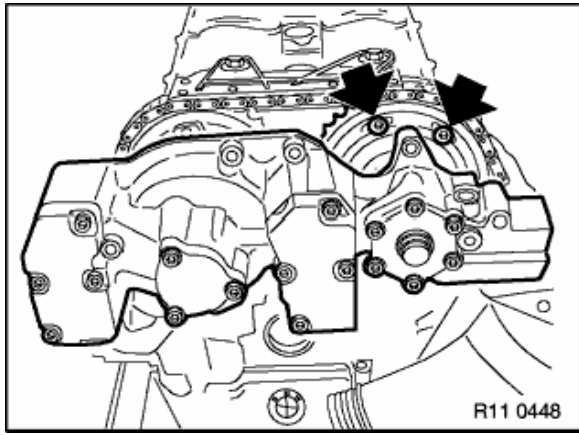
Tighten down the two accessible screws on the exhaust end of the VANOS unit.



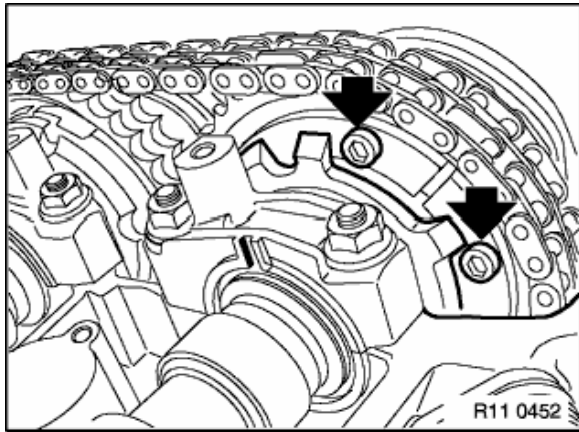
Remove special tool 11 2 300.



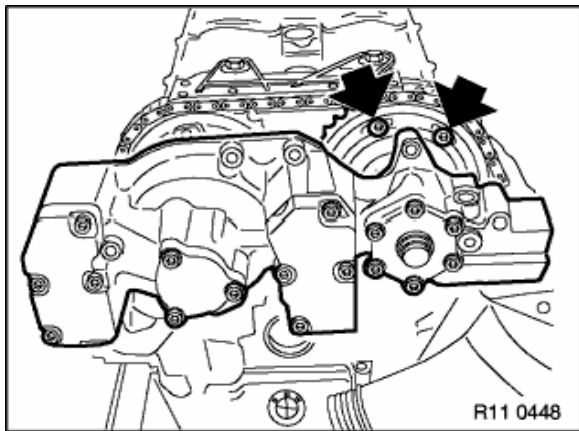
Fit special tool 11 5 100 to four screws on crankshaft hub.



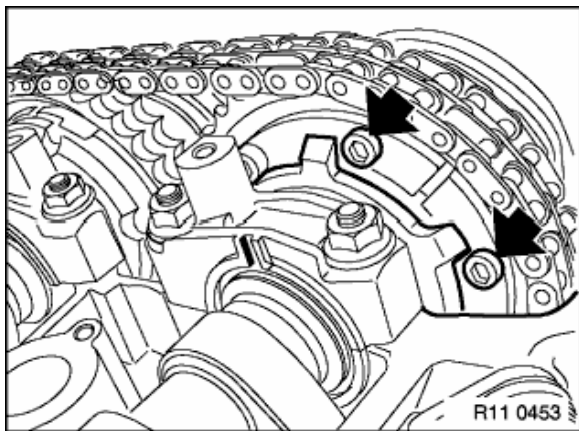
Continue rotating crankshaft in direction of rotation until two more screws are accessible on the intake end of the VANOS unit.  
Tighten these two bolts.



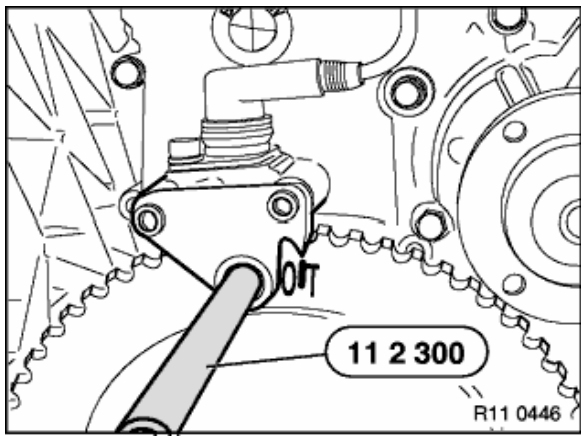
Tighten down the two accessible screws on the exhaust end of the VANOS unit.



Continue to rotate crankshaft in direction of rotation until remaining two screws on intake end of VANOS unit are accessible.  
Tighten these two bolts.



Tighten down the last two screws on the exhaust end of the VANOS unit.

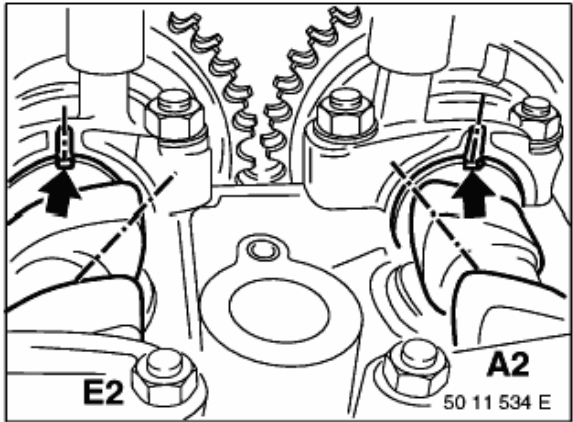


**Caution!**

Do not turn the engine back.

Turn engine in direction of rotation as far as TDC firing position of first cylinder.

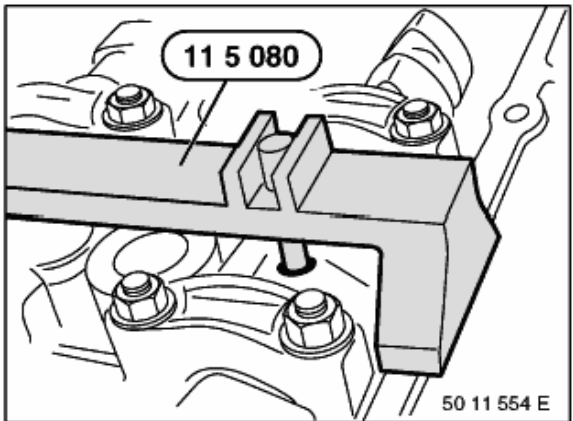
Secure vibration damper with special tool 11 2 300.



**Note:**

The grooves in the exhaust and intake camshafts are aligned with the grooves in the first bearing covers.

The cam tips of the exhaust and intake camshafts point to each other.

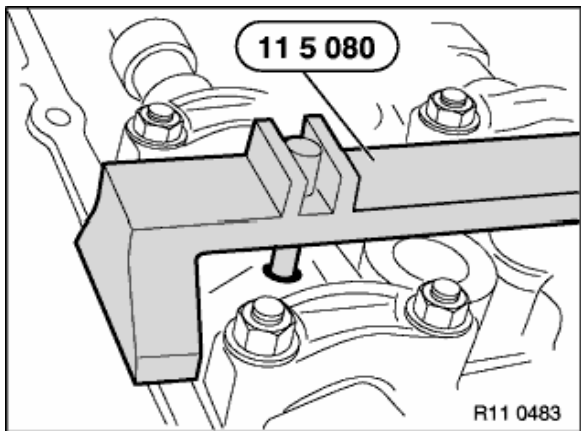


**Note:**

Check camshaft adjustment with special tool 11 5 080.

Special tool 11 5 080 inserted into intake camshaft.

Special tool 11 5 080 must rest on the timing case without a gap.



**Note:**

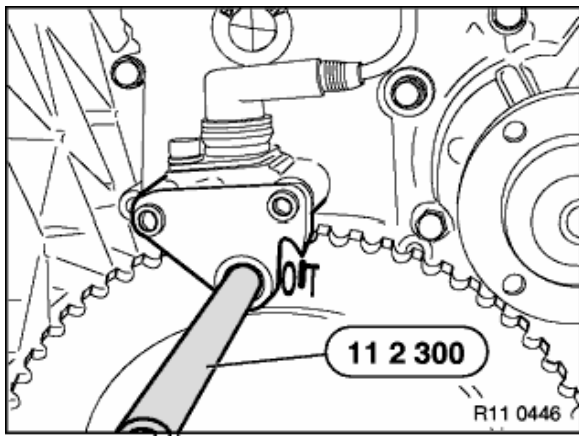
Check camshaft adjustment with special tool 11 5 080.

Special tool 11 5 080 inserted into exhaust camshaft.

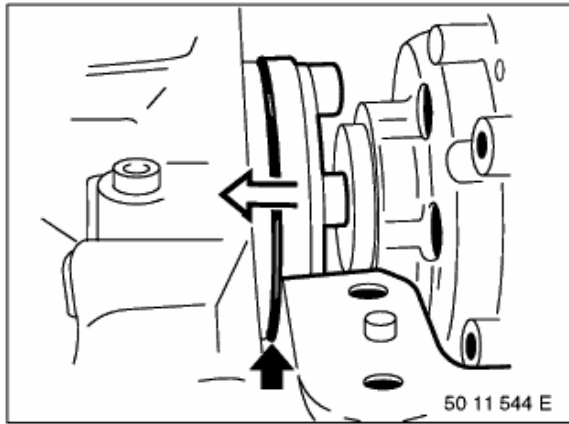
Special tool 11 5 080 must rest on the timing case without a gap.

Remove special tool 11 5 080.

Remove special tool 11 2 300.



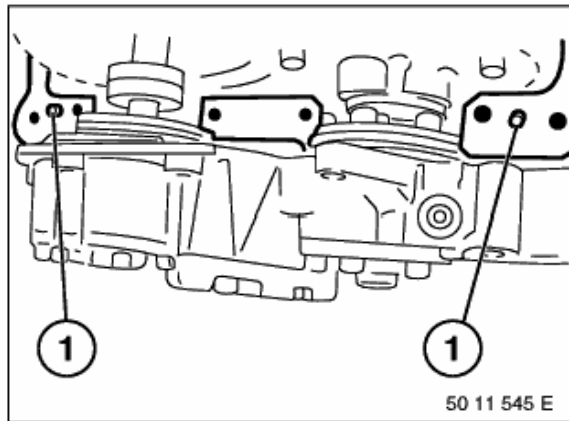
Unfasten screws on VANOS adjustment unit and retract VANOS adjustment unit from timing case until O-rings are exposed.



Clean and degrease sealing surfaces between end cover and timing case.

Apply thin and uniform coat of 3 Bond 1209 sealing compound, refer to BMW Parts Service.

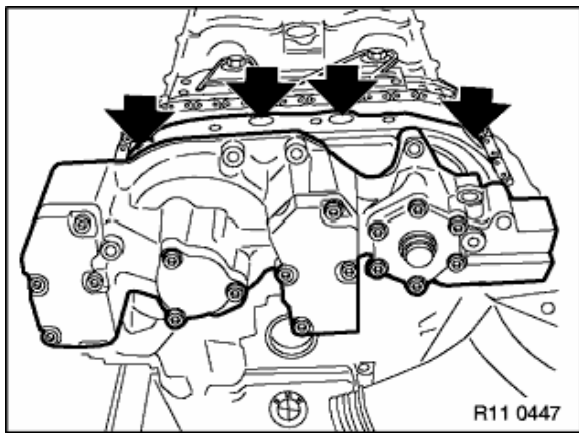
Pay attention to dowel pins (1).



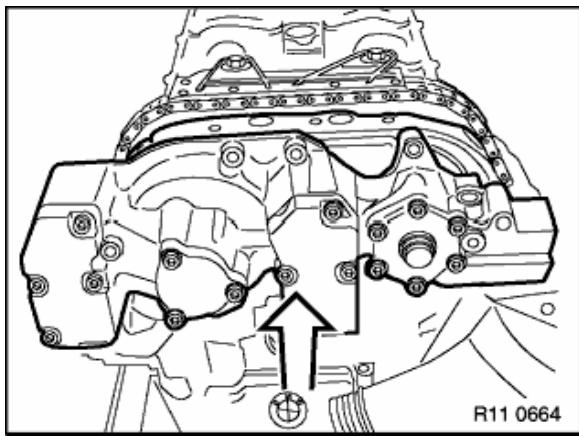
### Caution!

The radial piston pump is no longer accessible after fitting the end cover (VANOS bridge). Check position of radial piston pump relative to driver on splined hub and realign if necessary.

Fit end cover (VANOS bridge) to timing case and tighten down.



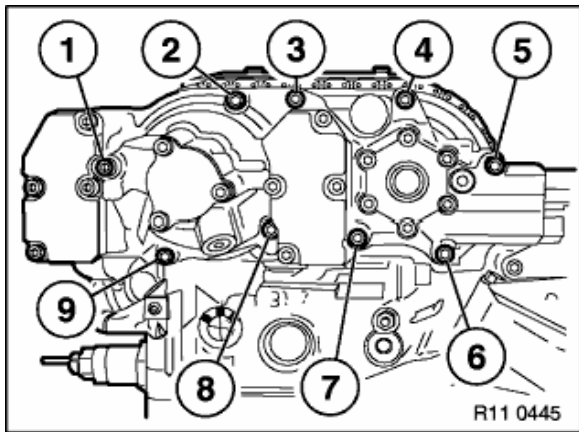
Push in VANOS control unit as far as timing case.



**Note:**

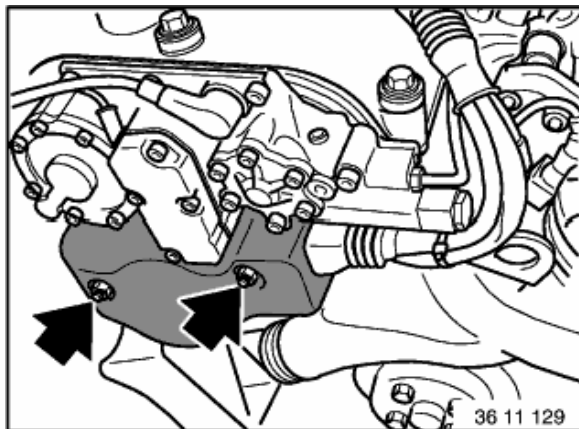
Secure ground tape with screw (7).

Install screws (1 ... 9) of VANOS adjustment unit, pretighten to approx. 5 Nm and then tighten securely in a second tightening procedure.



Insert screw connections in solenoid valves.

Fit cover to plug connections.



Fit oil pipe to VANOS adjusting unit.

Tightening Torque,  
refer to Technical Data 11 36 9AZ  
Assemble engine.

