

11 36 046 Removing and installing or replacing intake and exhaust camshaft adjusters (N55)



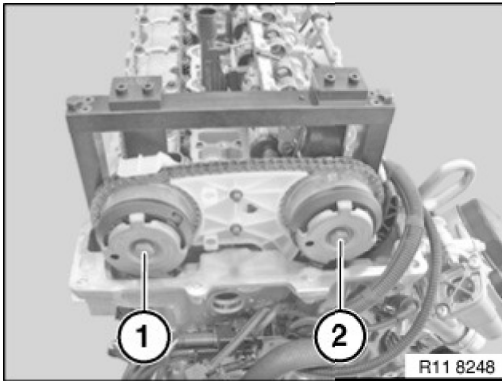
Special tools required:

- 00 9 120
- 00 9 250
- 11 4 280
- 11 4 290
- 11 9 340



Necessary preliminary tasks:

- Remove cylinder head cover.
- Check timing.

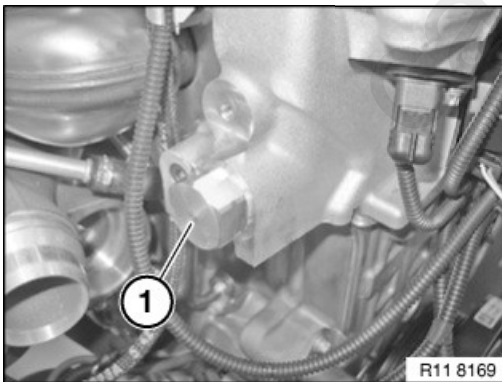


Important!

Only use special tool 11 4 280 to loosen central bolts (1 and 2) of VANOS unit.

Modify special tool 11 4 280 for N55 engine.

Release central bolts (1 and 2).



Release chain tensioner (1).

Tightening torque 11 31 7AZ.

Important!

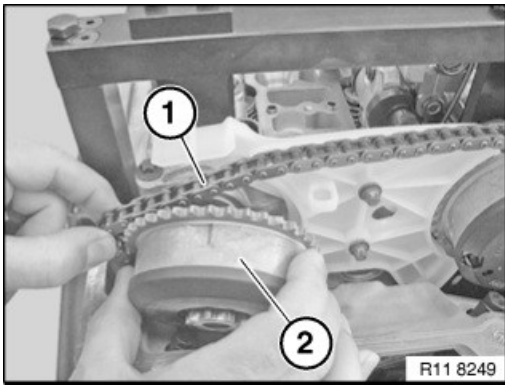
Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.

Make sure no engine oil runs onto belt drive.

Installation note:

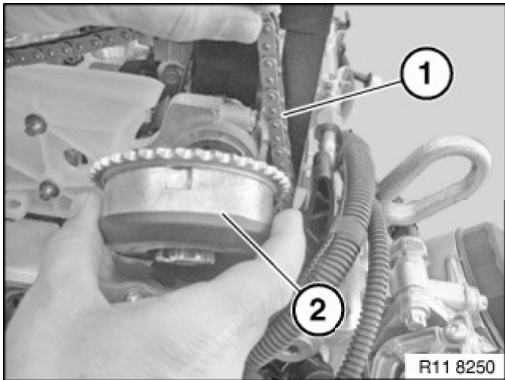
Replace sealing ring.





Slightly lift timing chain (1) and remove exhaust camshaft adjuster (2) from exhaust camshaft.

Slightly tilt exhaust camshaft adjuster (2) and remove upward.



Slightly lift timing chain (1) and remove intake adjuster (2) from intake camshaft.

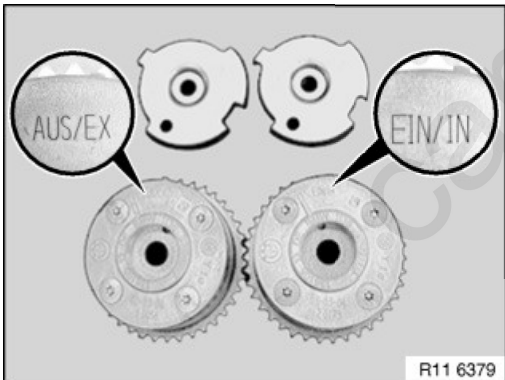
Slightly tilt intake adjuster (2) and remove upward.



Important!

Risk of mixing up the intake and exhaust camshaft adjusters.

Danger of engine damage!

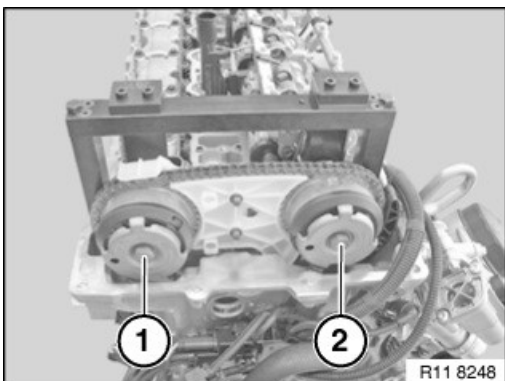


Intake and exhaust camshaft adjusters are different.

The variable camshaft timing control is marked with AUS/EX for the exhaust camshaft.

The variable camshaft timing control is marked with EIN/IN for the intake camshaft.

The increment wheels can be fitted alternatively.



Installation note:

Replace central bolts.

Place intake adjuster onto intake camshaft.

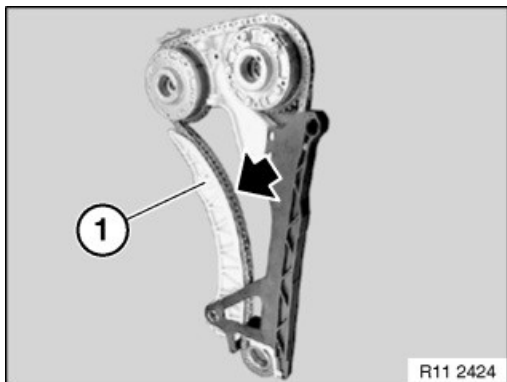
Place exhaust camshaft adjuster onto exhaust camshaft.

Installation position of intake and exhaust camshaft adjusters can be freely selected.

Insert central bolts (1) until stop.

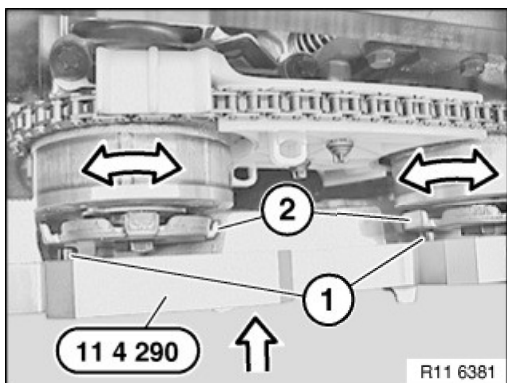
Release central bolts (1) again by a 90° turn.





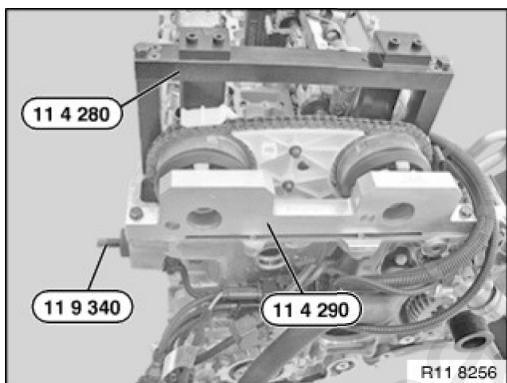
Important!
Incorrect assembly possible!

Press tensioning rail (1) by hand against guide rail and make sure timing chain is guided in tensioning rail (1). *Note:*
 Schematic representation of removed timing chain module.



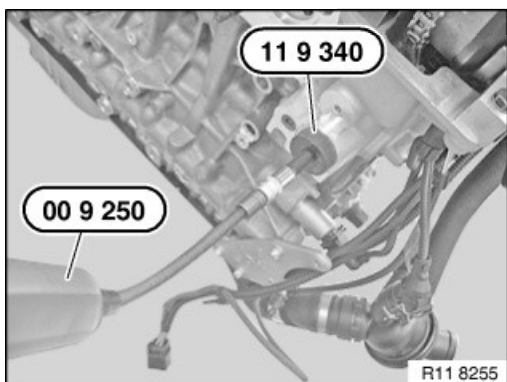
Turn increment wheel (2) in direction of arrow until retaining pins (1) on special tool 11 4 290 match up.

11 4 290 Slide on special tool in direction of arrow.



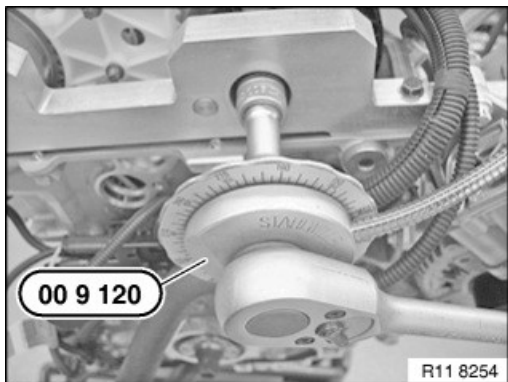
Special tool 11 4 280 must be mounted for fastening central bolts
 Use bolts to fasten special tool 11 4 290 .

11 9 340 Screw special tool into cylinder head.

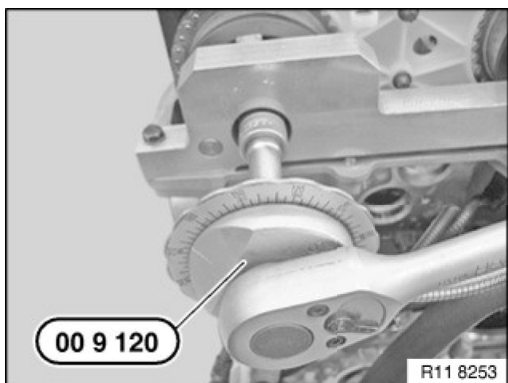


Pretension timing chain with special tool 11 9 340 00 9 250 **0,6 Nm**





Use special tool 00 9 120 to tighten central bolts of intake adjuster.
Tightening torque 11 36 1AZ.



Use special tool 00 9 120 to tighten central bolts of exhaust camshaft adjuster.
Tightening torque 11 36 1AZ.



Remove all special tools.

Rev engine on the central bolt twice in the direction of engine rotation and verify timing.

Assemble engine.



**Important!**

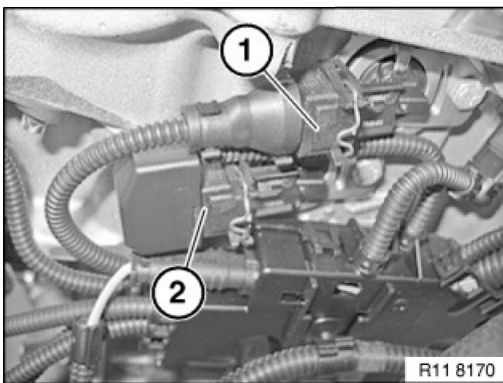
On removing and installing the VANOS solenoid valve (intake) and VANOS solenoid valve (exhaust), adhere to conditions of absolute cleanliness.

Possible malfunction if there is dirt contamination in the valves:

- Irregular operation
- OBD fault entry
- Exhaust gas emission characteristics.
- Low engine performance

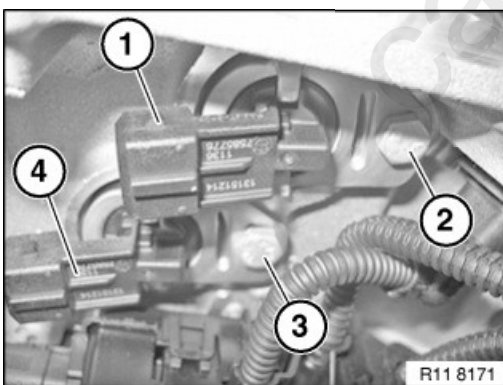
*Necessary preliminary tasks:*

- Remove ignition coil cover.



Disconnect plug connection (1) on VANOS intake solenoid valve.

Disconnect plug connection (2) on VANOS exhaust solenoid valve.



Release screw (2).

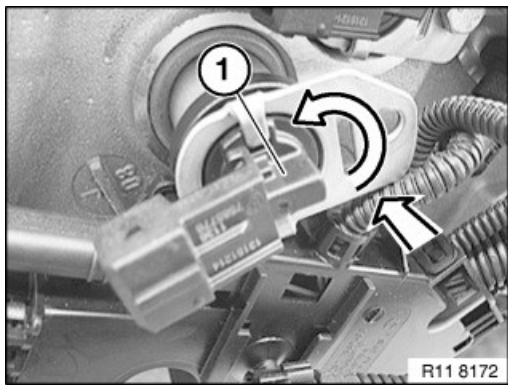
Remove VANOS intake solenoid valve (1) with holder towards the front.

Release screw (3).

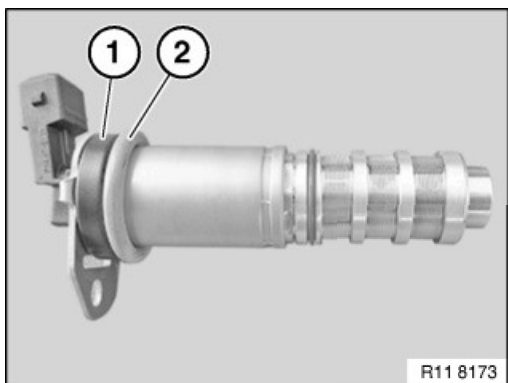
Move VANOS exhaust solenoid valve (4) with holder approx. 10 millimetres towards the front

Tightening torque 11 36 3AZ.





Turn the VANOS exhaust solenoid valve (1) approx. 90° in direction of arrow until it can be removed from the front on engine wiring harness.



Remove O-ring (2).

Remove support ring (1).

Installation note:

Replace support and O-rings.



Assemble engine.

Check function of Digital Engine Electronics.



**Warning!**

The preloading on the throttle return springs increases as the rotation on the worm gear increases. **Danger of injury!**

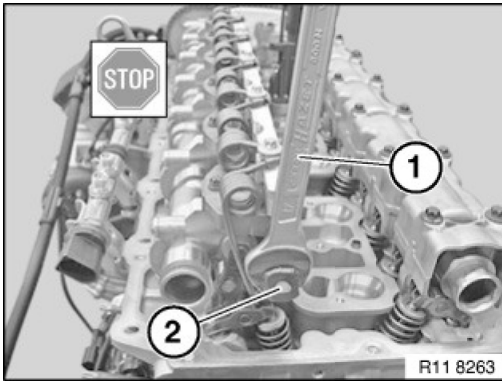
The eccentric shaft may only be twisted on the mounting flats for protection.

Risk of damage to the eccentric shaft gearing and to the servomotor worm drive.

The eccentric shaft must **not** spring back to the minimum stroke stop. **Risk of damage!**

*Necessary preliminary work:*

- Remove cylinder head cover.
- Remove ignition coil and injector shafts.

**Warning!**

Heed stop installation instructions.

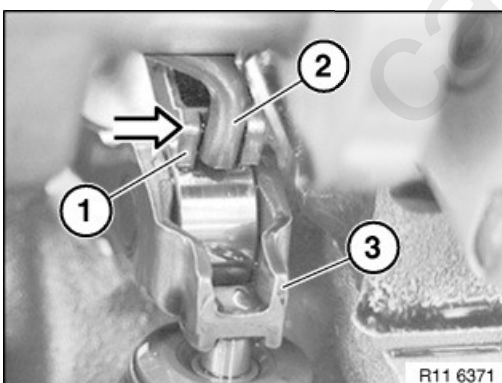
The eccentric shaft on the mounting flats (2) must only be turned with an open-end spanner (1) for support.

The eccentric shaft has **mounting flats on both sides**; if the engine is installed, the front mounting flat must be used.

Heed the following work instructions.

After the engine stops, the eccentric shaft is in the maximum stroke position.

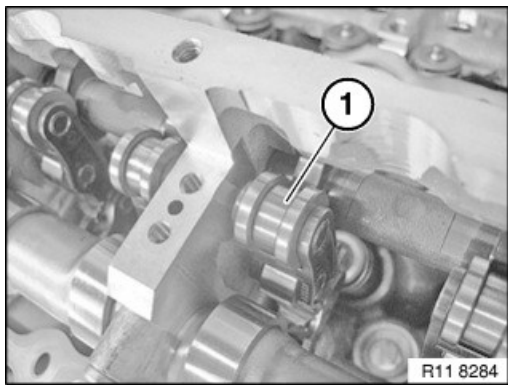
If the actuator drive is defective, the eccentric shaft is located in an undetermined position.



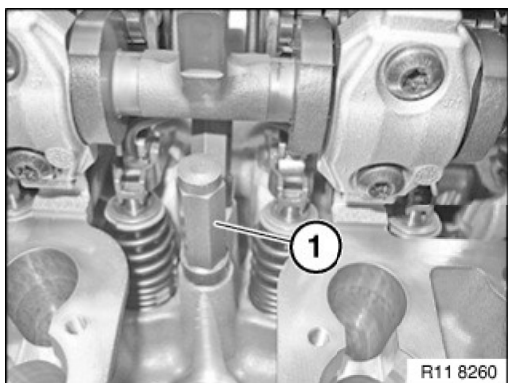
Check throttle return spring (2) for breakage and correct installation position on intermediate lever (1).

Check roller cam follower (3) for correct installation position.

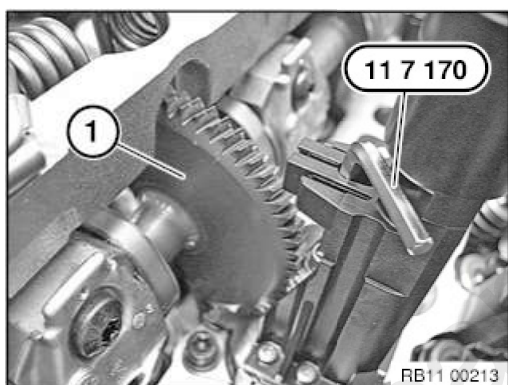




Check that intermediate lever (1) is correctly seated. *Note:* Graphic does not show sliding block.



Check wear at stop (1) - minimum lift and maximum lift.
Check that stops are securely seated.
Tightening torque: 11 37 5AZ.



Stiff movement in eccentric shaft bearing is excluded.
Stiff movement can occur in worm gear.



Assemble engine.

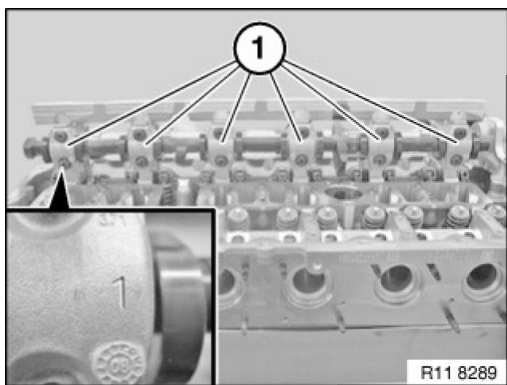


**Special tools required:**

- 11 4 481

**Necessary preliminary tasks:**

- Remove cylinder head cover.
- Remove servomotor for eccentric shaft drive.
- Remove intermediate lever.

**Note:**

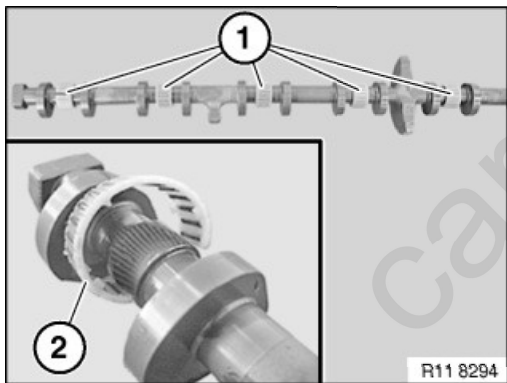
All bearing caps (1) of eccentric shaft are marked with numbers from 1 to 6 (1 for 1st cylinder to 6 for 6th cylinder).

Release screws on bearing caps 1 to 6 (1).

Set all bearing caps down in special tool 11 4 481 in a neat and orderly fashion.

Remove eccentric shaft with gentle tilting and swivel motion.

Place eccentric shaft on special tool 11 4 481 .

**Attention!**

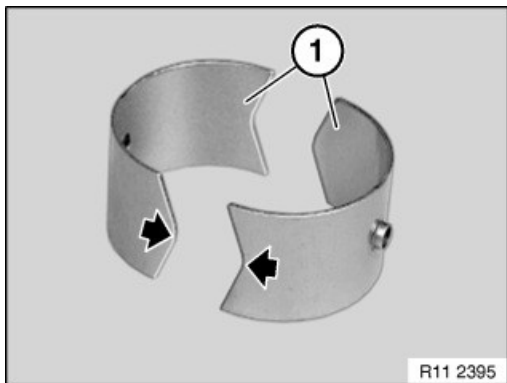
Needle bearings (1) can break very easily.

Installation note:

Replace eccentric shaft.

Carefully pull needle bearing (2) apart at point of separation.

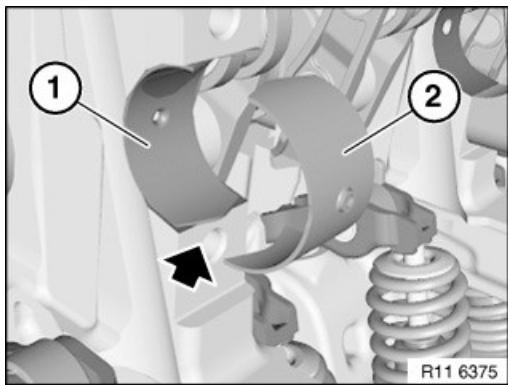
Slide on all needle bearings (1) of eccentric shaft.



Install bearing shells (1) as pictured. **Note:**

If bearing shells need to be replaced due to a defect, always replace bearing shells (1) and needle bearings together.

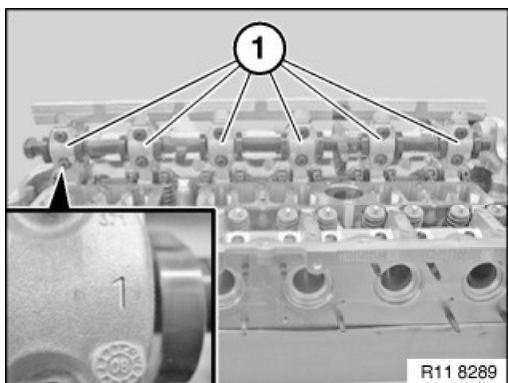




Installation note:

Any installation position may be selected for bearing shells (1 and 2).

If bearing shells (1) in cylinder head are inserted with tips pointing downward, the bearing shells (2) must be inserted in the opposite direction in the bearing cap (see example in picture).



Installation note:

All bearing caps (1) of eccentric shaft are marked with numbers from 1 to 6 (1 for 1st cylinder to 6 for 6th cylinder).

Insert eccentric shaft.

Coat all bearing positions with engine oil.

Put on all bearing caps (1) according to cylinder assignment.

Insert all screws.

Tightening torque 11 31 2AZ.

Installation note:

Gearing of eccentric shaft must be greased with Longtime PD 1 (4.1).



Check intermediate shaft for ease of movement.

Assemble engine.



**Special tools required:**

- 11 4 450
- 11 4 481
- 11 7 110

**Warning!**

Risk of injury in event of incorrect use.

Important!

Improper handling. **Risk of damage!**

**Important!**

Aluminium screws/bolts must be replaced each time they are **released**.

Aluminium screws/bolts are permitted with and without colour coding (blue).

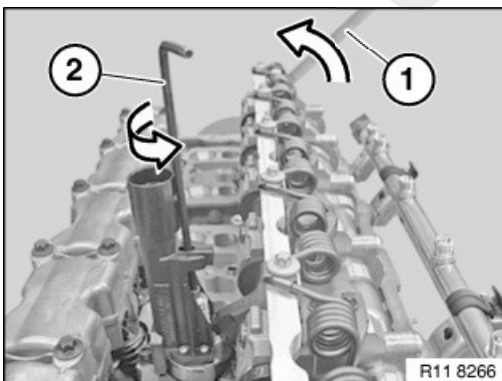
For reliable identification:

Aluminium screws/bolts are **not magnetic**.

Joining torque and angle of rotation must be observed without fail (**risk of damage**).

*Necessary preliminary tasks:*

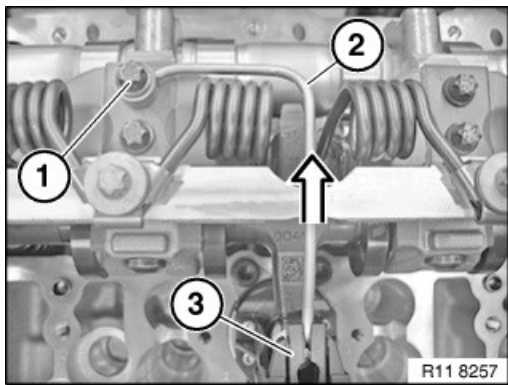
- Remove cylinder head cover.
- Remove all ignition coils and injector shafts.
- Remove console for windscreen wiper (only E7x).



Slowly adjust eccentric shaft in direction of arrow to minimum stroke via the servomotor with a 4-mm hexagon socket wrench (2) and an open-end spanner (1). **Important!**

Secure eccentric shaft with open-end spanner (1) (risk of return stroke).

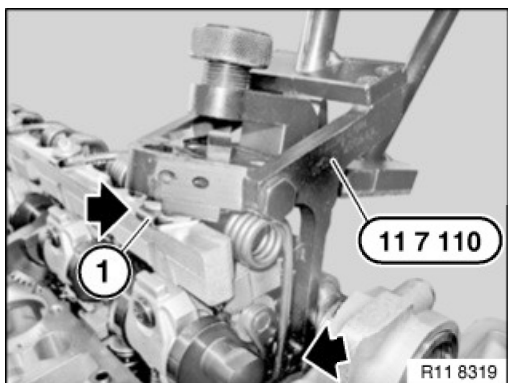




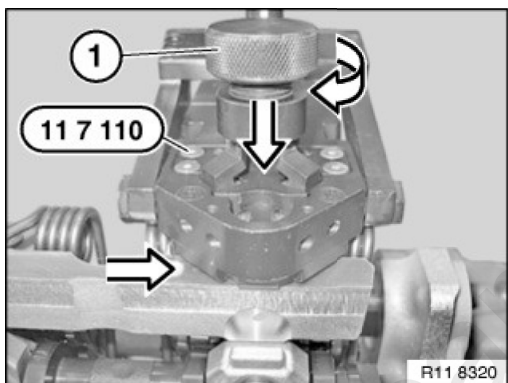
Release bolt (1) on the oil spray nozzle.

Tightening torque: 11 37 4AZ.

Unclip oil spray nozzle (2) from the bracket on the actuator drive (3) in direction of arrow.



Position special tool 11 7 110 on return spring (1) (see arrows).



Warning!

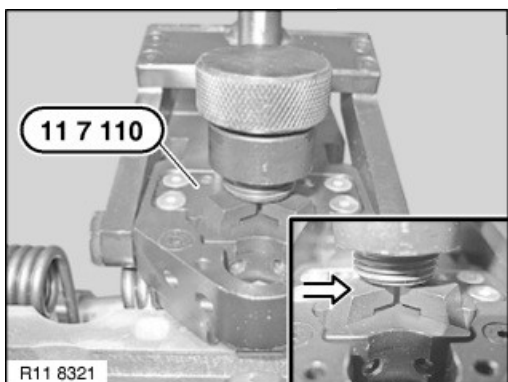
Risk of injury in event of incorrect use.

Important!

Improper handling. **Risk of damage!**

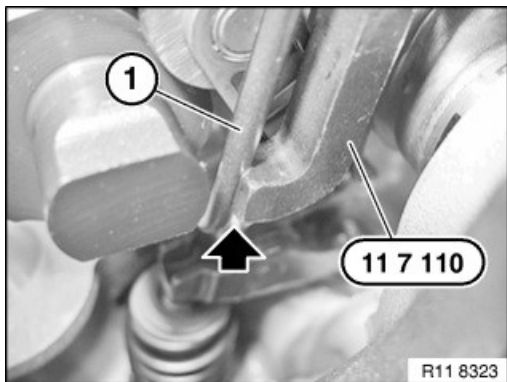
Place special tool 11 7 110 flat on cylinder head.

Turn knurled screw (1) in direction of arrow until both clamping levers secure return spring in gate.



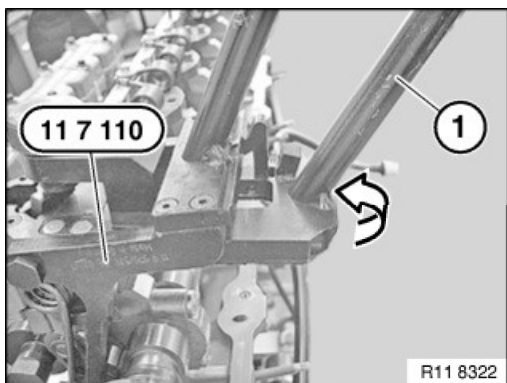
Return spring is correctly preloaded when both clamping levers are parallel to guide block.



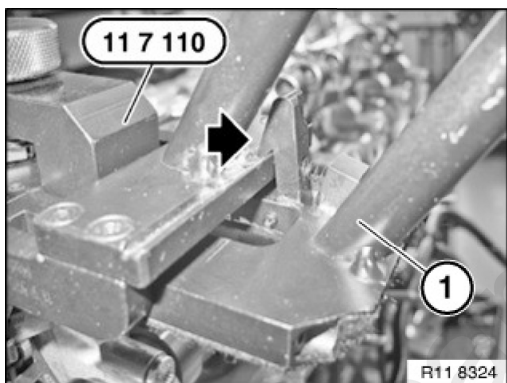


Important!
Risk of damage!

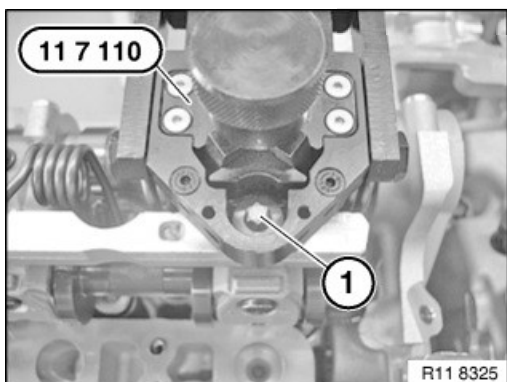
Left and right return springs (1) must be positioned in lateral guide of special tool 11 7 110 .



Preload return spring with lever (1) on special tool 11 7 110 in direction of arrow.

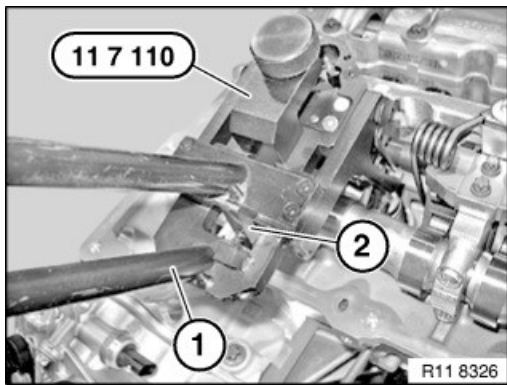


Lock special tool 11 7 110 with latching hook on lever (1). **Important!**
Screw connection on return spring can first be released with secured special tool 11 7 110 .



Release screw (1).





Warning!

Risk of injury in event of incorrect use.

Lever (1) is preloaded.

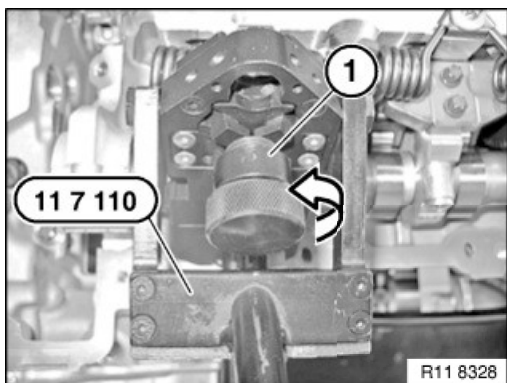
Important!

Improper handling. **Risk of damage!**

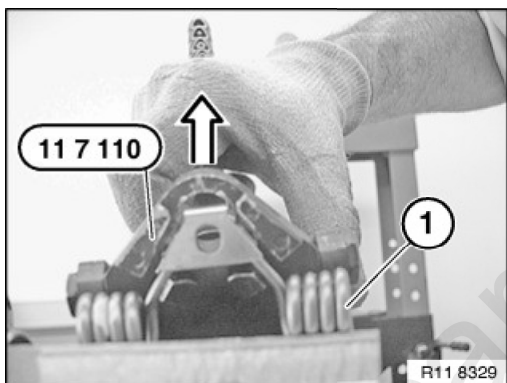
Secure lever (1).

Press back latching hook (2).

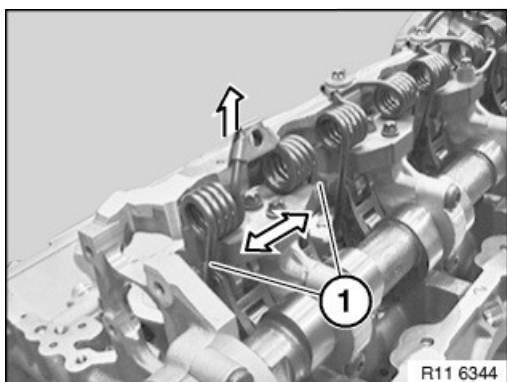
Return spring tension can now be released.



Release knurled screw (1) on special tool 11 7 110 in direction of arrow.



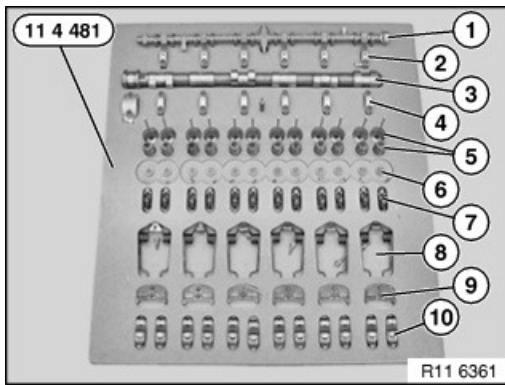
Release special tool 11 7 110 in direction of arrow from return spring (1).



Press return spring (1) apart.

Remove return spring (1) upward.





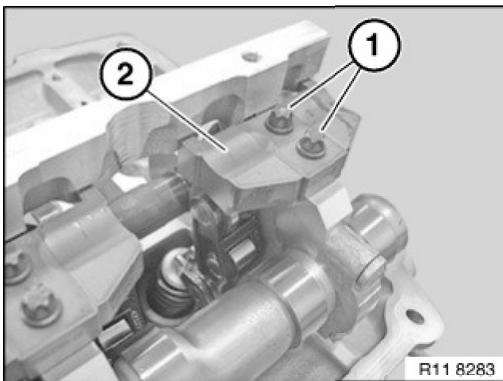
Important!

Uniform distribution must **not** be changed.

Place all components in clean and orderly condition in special tool 11 4 481 .

All components must be reinstalled in the same positions in an engine which has already been in use.

- 1 Eccentric shaft with bearing
- 2 Bearing caps of eccentric shaft (set out in order)
- 3 Intake camshaft
- 4 Bearing caps of intake camshaft (set out in order)
- 5 Intake valves with valve springs
- 6 Valve heads and valve keys
- 7 Rocker arms with hydraulic valve clearance compensating elements (in neat order).
- 8 Return springs.
- 9 Gates (set out in order)
- 10 Intermediate levers (set out in order)



Release screws (1) on gate (2).

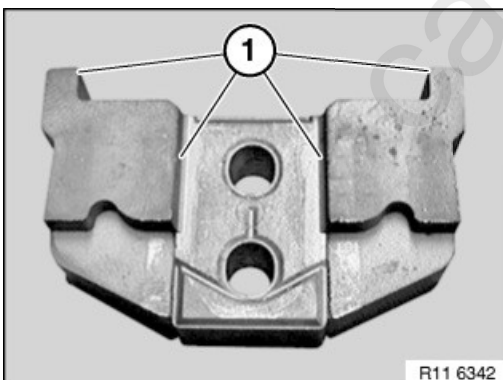
Tightening torque 11 37 1AZ.

Place all gates (2) in neat order in special tool 11 4 481 .

Installation note:

Mixing up the gates (2) will cause the engine to suffer idle-speed fluctuations.

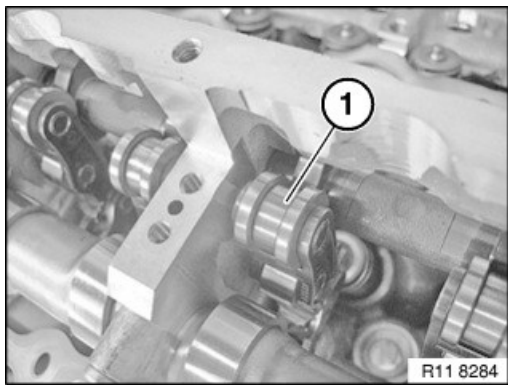
This will result in maladjustment of uniform distribution.



Installation note:

All contact surfaces (1) of gates must be clean and free from oil and grease. If necessary, clean contact surfaces (1).





Lift out intermediate levers (1).

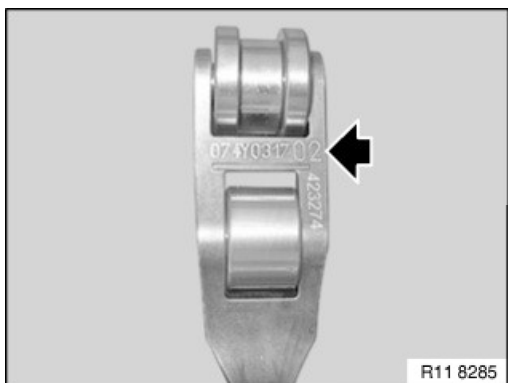
Place all intermediate levers (1) in neat order in special tool 11 4 481 .

Installation note:

Mixing up the intermediate levers (1) will cause the engine to suffer idle-speed fluctuations.

Installation note:

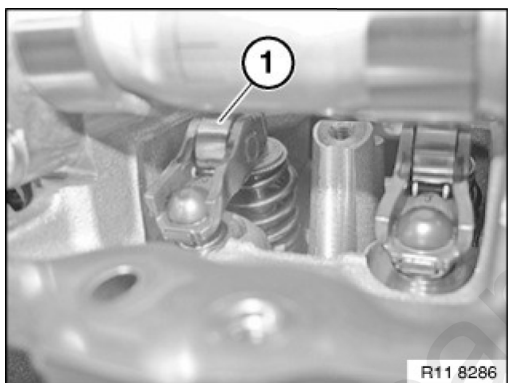
All contact surfaces must be clean and free of oil and grease . If necessary, clean contact surfaces.



All intermediate levers are classified.

All intermediate levers must be reinstalled in the same positions in an engine which has already been in use.

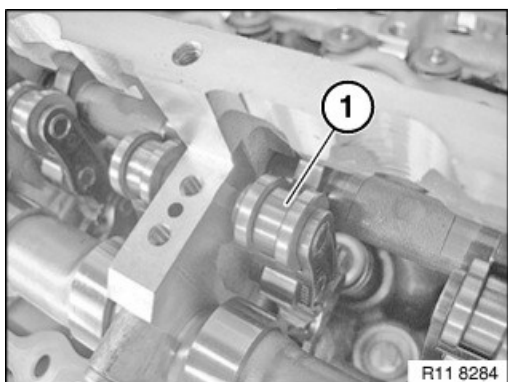
Intermediate levers are classified from 1 to 5.



Important!

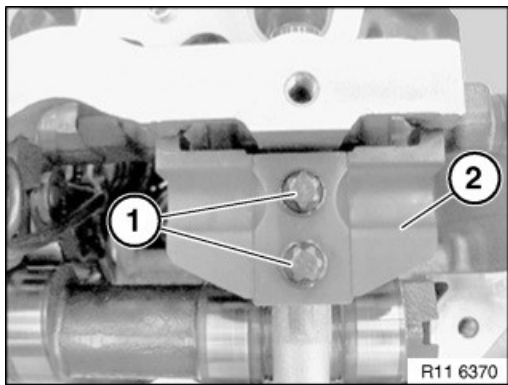
Before installing intermediate levers (1), make sure rocker arms are correctly positioned.

Risk of damage!



Install intermediate levers (1).



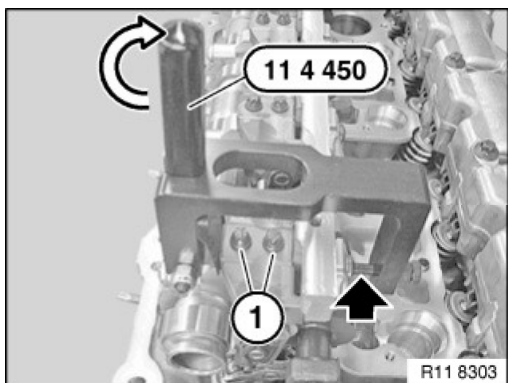


Fit gate (2) cleanly into recess.

Tighten screws (1) hand-tight.

Check that intermediate levers are in correct installation position.

Release screws (1) by a 1/4 turn.



Secure special tool 11 4 450 on screw connection (1) of eccentric shaft and set adjusting screw on special tool 11 4 450 if necessary.

Turn eccentric lever on special tool 11 4 450 in direction of arrow.

Gate is now preloaded.

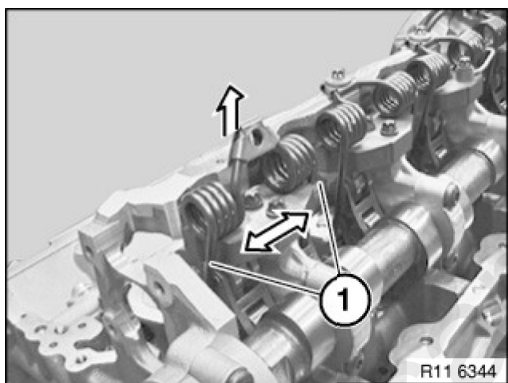
Insert screws (1) of gates.

Tightening torque 11 37 1AZ.

Installation note:

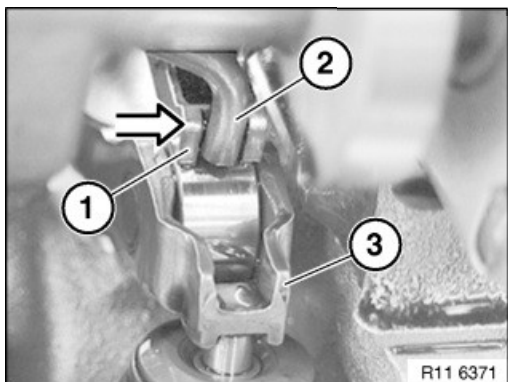
At cylinder no. 3, the gate can be pre-installed with one screw (internal) only.

Oil spray nozzle is fitted only after return spring has been installed.



Press return spring (1) apart.

Install return spring (1).

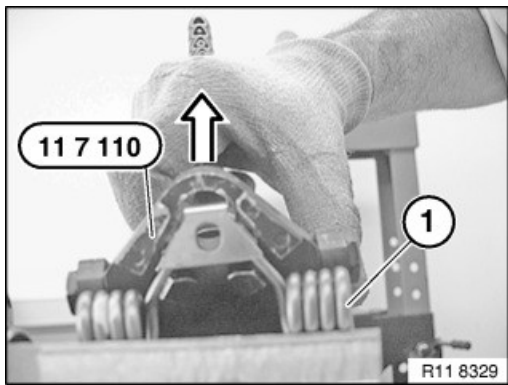


Install return spring (2) on gate. *Installation note:*

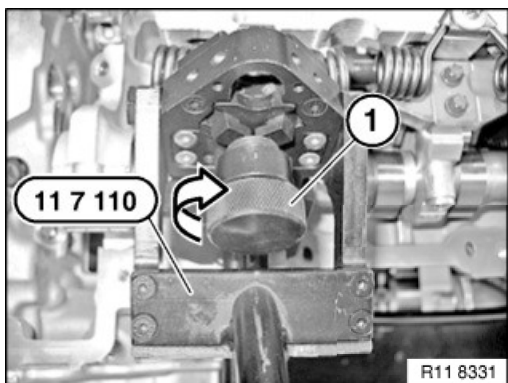
Insert return spring (2) in intermediate lever (1) (see arrow).

Check that rocker arm (3) is in correct installation position.

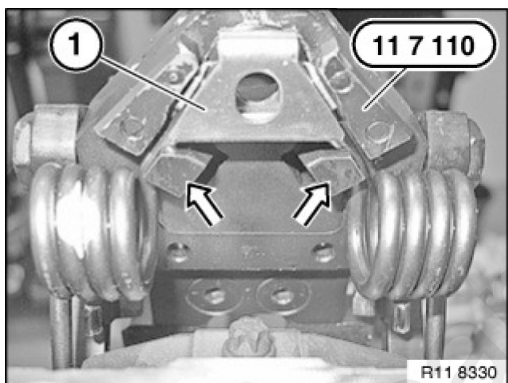




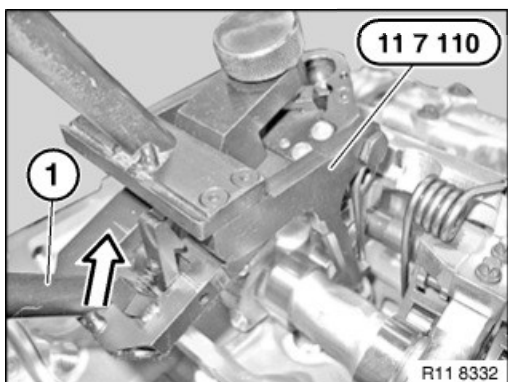
Position special tool 11 7 110 on return spring.



Clamp return spring with knurled screw (1) in direction of arrow.



Return spring (1) is positioned correctly when latching hooks surround return spring (1).



Warning!

Risk of injury in event of incorrect use.

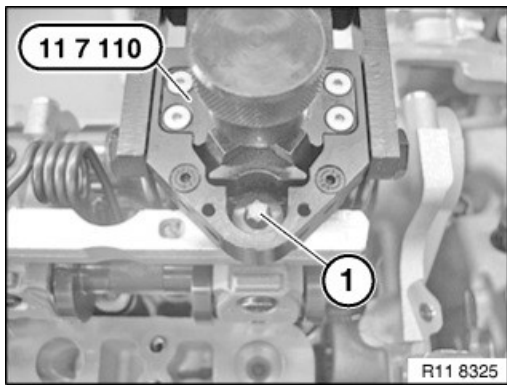
Important!

Improper handling. **Risk of damage!**

Check return spring on intermediate lever to ensure correct installation position.

Press special tool 11 7 110 to stop in direction of arrow.



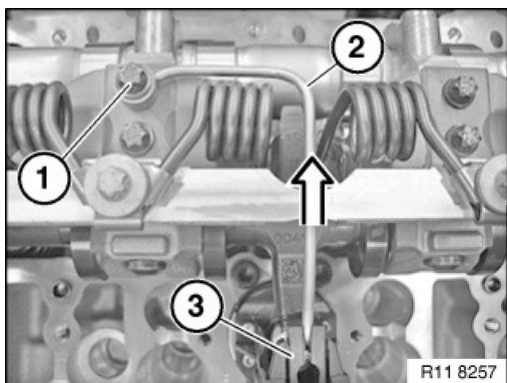


Important!

Pay attention to thread on cylinder head. **Risk of damage!**

Tighten bolt (1).

Tightening torque 11 37 2AZ.



Retract oil spray nozzle (2) on actuator drive (3).

Engage bolt (1) and release back to 90°.

For exact positioning of the oil spray nozzle (2) audibly clip it in at the top.

Tightening torque 11 37 4AZ.



Assemble engine.





Warning!

The preloading on the throttle return springs increases as the rotation on the worm gear increases. **Danger of injury!**

The eccentric shaft may only be twisted on the mounting flats for protection.

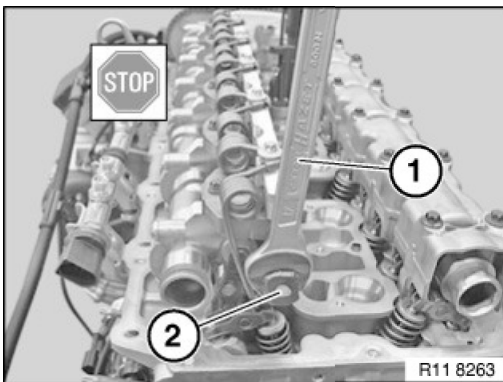
Risk of damage to the eccentric shaft gearing and to the servomotor worm drive.

The eccentric shaft must **not** spring back to the minimum stroke stop. **Risk of damage!**



Necessary preliminary tasks:

- Remove cylinder head cover.
- Remove ignition coils and injector shafts of cylinders 1 to 4.



Warning!

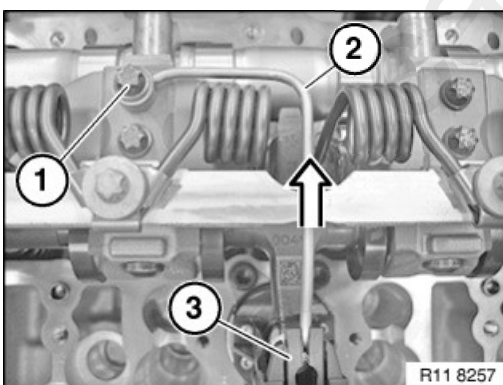
Heed stop installation instructions.

The eccentric shaft on the mounting flats (2) must only be turned with an open-end spanner (1) for support.

Heed the following work instructions.

After the motor stops, the eccentric shaft is in the maximum stroke position.

If the actuator drive is defective, the eccentric shaft is located in an undetermined position.

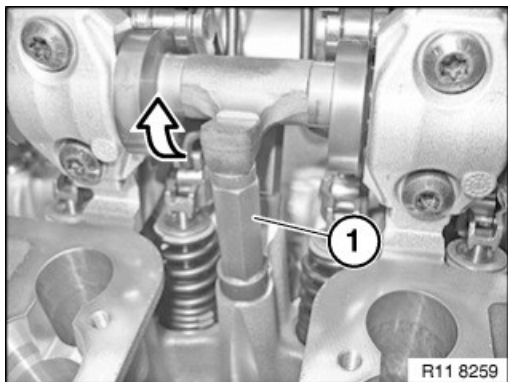


Release bolt (1) on the oil spray nozzle.

Tightening torque: 11 37 4AZ.

Unclip oil spray nozzle (2) from the bracket on the actuator drive (3) in direction of arrow.





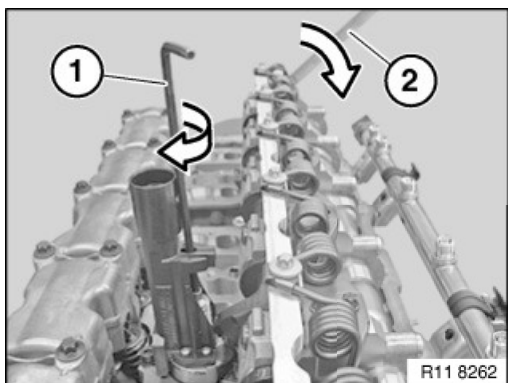
If the eccentric shaft is not on maximum stroke, the eccentric shaft must be adjusted to maximum stroke.

Important!

Fix eccentric shaft with an open-end spanner (kickback danger)

Adjust eccentric shaft only on the hexagon socket of the actuator drive (preload).

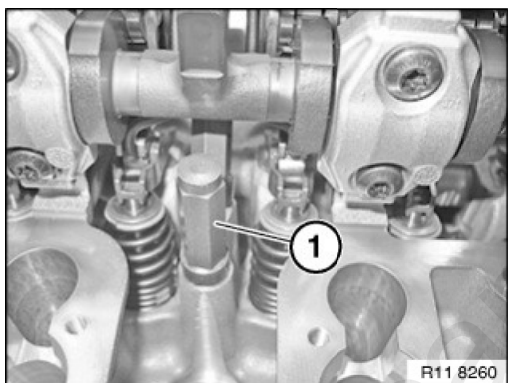
Remove minimum stroke stop (1).



Turn 4-mm hexagon socket wrench (1) clockwise in direction of arrow (maximum stroke).

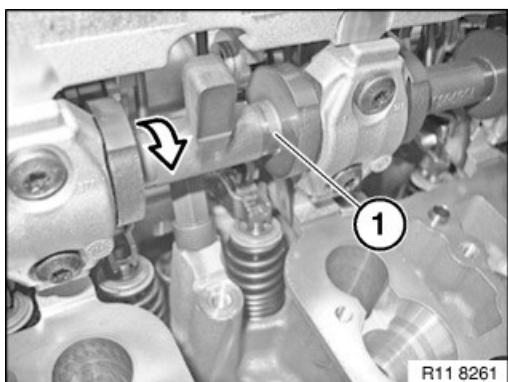
Secure eccentric shaft with an open-end spanner (2) for support in direction of arrow.

Fix eccentric shaft with an open-end spanner (2) (kickback danger)



Remove minimum stroke stop (1).

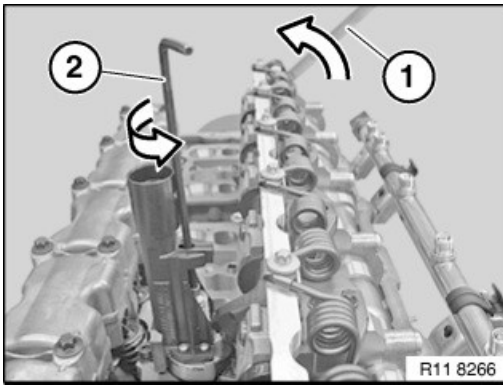
Tightening torque: 11 37 5AZ.



Adjust eccentric shaft (1) to minimum stroke in direction of arrow via servomotor. **Important!**

Secure eccentric shaft with an open-end spanner (kickback danger)



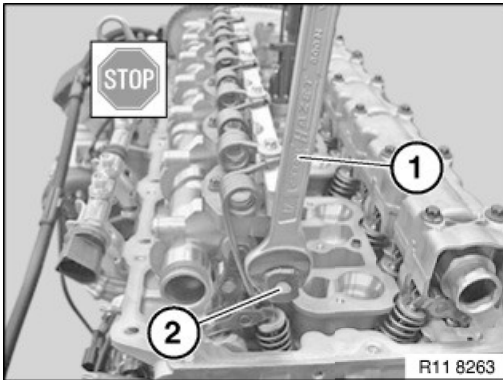


Slowly adjust eccentric shaft in direction of arrow to minimum stroke via the servomotor with a 4-mm hexagon socket wrench (2) and an open-end spanner (1).

Important!

Secure eccentric shaft with an open-end spanner (1) (kickback danger)

Release gearing of the eccentric shaft from worm drive.

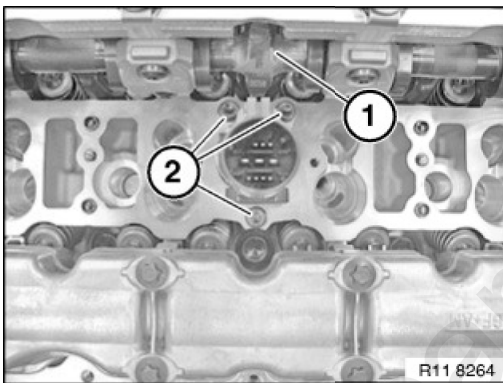


Important!

Eccentric shaft (2) is no longer connected to the worm drive of the servomotor in this working position.

Turn eccentric shaft (2) approximately 90° further with an open-end spanner (1).

Secure eccentric shaft (2) against kickback with the assistance of a second person.

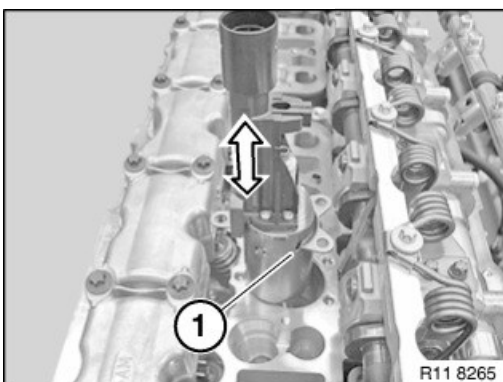


Important!

Eccentric shaft (1) is located in a relaxed position.

Secure eccentric shaft (1) against kickback with the assistance of a second person.

Unfasten screws (2).



Remove servomotor (1) upward in direction of arrow. *Installation note:* Clean blind holes with compressed air.

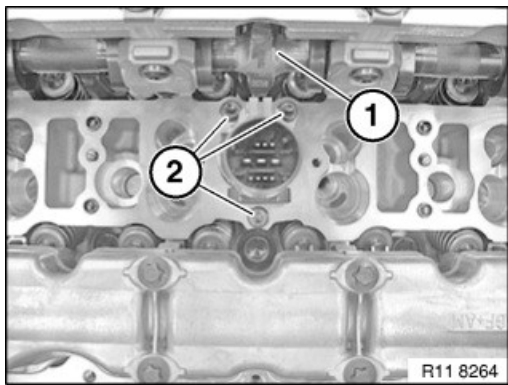
Install servomotor (1) downward in direction of arrow.

Secure eccentric shaft against kickback with the assistance of a second person.

Installation note:

The gearing of the eccentric shaft and the worm gear must be greased with Long-time PD 1 (4.1).





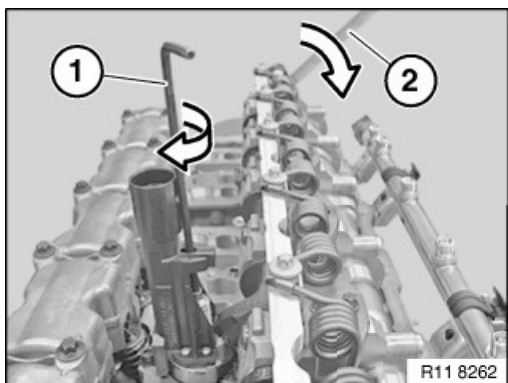
Installation note:

Eccentric shaft and worm drive must now be joined.

Carefully mate eccentric shaft gear in the worm shaft of the servomotor by simultaneously pressing and turning on the actuator drive.

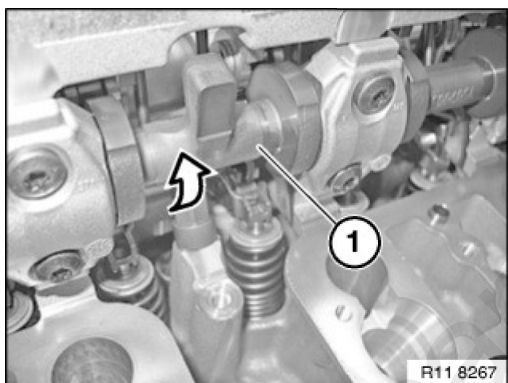
Insert bolts (2).

Tightening torque: 11 37 3AZ.



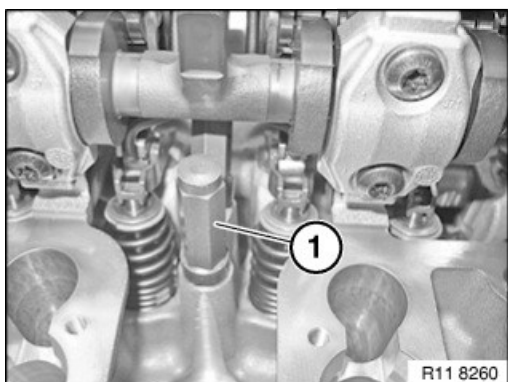
Preload eccentric shaft to maximum stroke with a 4-mm hexagon socket wrench (1) on the servomotor in direction of arrow.

Fix eccentric shaft with an open-end spanner (2) for support and secure (kickback danger).



Adjust eccentric shaft (1) back to maximum stroke in direction of arrow via servomotor. **Important!**

Fix eccentric shaft with an open-end spanner and secure. (kickback danger)



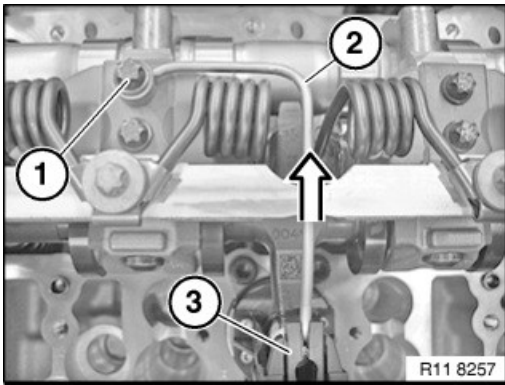
Screw in stop (1) for minimum stroke.

Tightening torque: 11 37 5AZ.

Important!

Fix eccentric shaft with an open-end spanner and secure. (kickback danger)





Retract oil spray nozzle (2) on actuator drive (3).

Engage bolt (1) and release back to 90°.

For exact positioning of the oil spray nozzle (2) audibly clip it in at the top.

Secure oil spray nozzle (2) with screw (1).

Tightening torque: 11 37 4AZ.



Remove all special tools.

Assemble engine.

Check function of Digital Engine Electronics.

- Service function.
- Drive.
- Digital Motor Electronics
- Valvetronic run-in procedure.

