

Camshaft and Bearing OM 621

Change: Note after item 7 and section B added.

Job No.
05-36

A. Removal and Installation

Removal:

1. Remove the camshaft sprocket (see Job No. 05-23, items 1-6).
2. Removal of the rocker arm brackets with rocker arms (see Job No. 05-5).
3. Unscrew the mounting screws for the two clamps for mounting the cylinder head cover and remove the clamps.
4. Loosen the mounting screws and nuts of the camshaft bearing brackets and remove the bearing brackets with camshaft.

Note: The mounting screws for the camshaft bearing brackets and for the clamps **also serve as cylinder head bolts. Therefore, loosen the bolts with cold engine only**, in order to avoid distortion of the cylinder head.

Checking:

5. Exactly check the contact surfaces of the camshaft bearing brackets and of the cylinder head. The surfaces must be absolutely even; this is of special importance for the 1st bearing bracket because the oil duct for lubricating the camshaft runs through this bearing bracket, and consequently oil pressure loss may be caused (see Fig. 05-36/1).

Note: The permissible unevenness on the upper side of the cylinder head must not exceed 0.1 mm in longitudinal direction and 0.01 mm in crosswise direction. **If after installation, i.e., after tightening of the cylinder head bolts, the camshaft moves hard**, dismount the cylinder head and remachine (see Job No. 01-5).

6. Check dowel pins for the camshaft bearing brackets, if necessary, replace.
7. Thoroughly clean the oil bores on the camshaft and/or in the cams as well as the oil

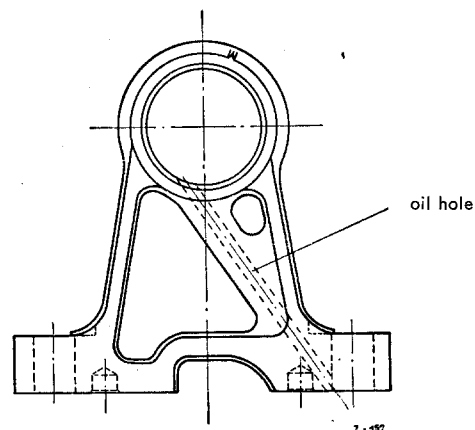


Fig. 05-36/1

Camshaft bearing bracket of the engine of model 190, seen from front

duct in the first camshaft bearing bracket, which leads from the left bolt bore to the camshaft seat (see Fig. 05-38/2 and 05-36/1).

Note: The lubricating system for the camshaft and the rocker arm was changed for model 190 Dc as from engine No. 621.912-10-062 967 and for models L and O 319 D as from engine No. 621.913-10-015 562. The engines are now provided with an external lubrication system on the camshaft. The present camshaft differs from the former camshaft insofar that it has no center hole and no lubricating holes. In addition, the new camshaft has larger bearing pins 2 and 3, as well as new camshaft bearings (0.5 mm larger in diameter, now 46.5 mm dia.); it is provided with oil grooves and oil wells. The pressure oil flows from the main oil duct through a hole into the 1st camshaft bearing (Fig. 05-36/3). The oil reaches the outer oil tube through the annular groove in the 1st camshaft bearing pin (Fig. 05-36/5). From here, the camshaft bearings 2 and 3, the cams as well as rocker arms, are fed with dropping or centrifugal oil, respectively. (For camshaft outer lubrication refer to section B).

8. Check the cams of the camshaft and use an oil stone to remove burrs or unevenness, if any.

Installation:

9. Apply graphited oil to the bearing bores of the camshaft bearing brackets. Slide the bearing brackets onto the camshaft and fit them on the cylinder head. First only tighten the mounting nuts of the bearing brackets.
10. Check the alignment of the camshaft bearings. **The camshaft should turn easily by hand.** A slight misalignment of the bearings can be corrected by tapping with a plastic hammer on the bearing base of the bearing subject to misalignment.
11. Fit the clamps for the cylinder head cover on the cylinder head; insert the cylinder head bolts into the clamps and into the camshaft bearing brackets and tighten with a torque of 8 mkg.

Note: Again check the camshaft for ease of movement; even after tightening of the cylinder head bolts it must turn easily by hand (if not, refer to Note of item 5).

12. Slide the spacer washer and the camshaft sprocket without chain on the camshaft and screw in and tighten the mounting screw with washer and lock washer for the camshaft sprocket.
13. Check the axial clearance of the camshaft (see Fig. 01-3/11). The axial clearance should amount to 0.05–0.128 mm. If the axial clearance is too large re-grind on the front side (a) of the 1st bearing pin, if too small, re-grind on the surface (b) on the collar of the 1st bearing pin (see Job No. 05-38, Section B, and Fig. 05-38/2).
14. If a new camshaft or a new 1st camshaft bearing bracket had been installed, do not fail to check the alignment of the sprocket wheels and correct, if necessary. The misalignment of all sprocket wheels, starting from the intermediate sprocket (sprocket at the injection timing device), must not exceed 0.1 mm, otherwise use a different spacer washer on the camshaft.

If no measuring device is available, the alignment can be checked from the contact surface for the cover of the injection timing device using straight edges and a depth gauge.

When measuring the misalignment, press all sprocket wheels rearwards against stop.

If correction is necessary, dismount the camshaft sprocket and replace the spacer washer. The spacer washers are available in the following thicknesses: 2.50 mm, 2.75 mm, 3.00 mm, 3.25 mm and 3.50 mm.

15. Turn the crankshaft in **direction of rotation** until the OT mark (TDC) on the counterweight (9) coincides with the adjusting pointer (10) (see Fig. 05-23/1).
16. Turn the camshaft with spacer washer in such a way that the marks on the spacer washer and on the 1st camshaft bearing bracket coincide (see Figure 05-27/1).
17. Again pull the camshaft sprocket and check whether the Woodruff key is correctly seated in the camshaft.

If an offset Woodruff key had been installed, see to it that it is re-installed in the correct position.

In this case, do not fail to check the timing (see Job No. 00-8, Section B).

18. Use a hook to pull the chain out of the chain box and slide the camshaft sprocket with the chain placed on it onto the camshaft.

To do this, do not fail to observe the Woodruff key and the marks on the spacer washer and on the camshaft bearing bracket (see Fig. 05-27/1).

The left half of the chain must then be tensioned since otherwise the adjustment of the camshaft varies after turning the engine.

19. Then mount the mounting screw for the camshaft sprocket with washer and lock washer and tighten.
 20. Turn the crankshaft back by $\frac{1}{4}$ of a turn, then forward until the OT mark (TDC) on the counterweight (9) coincides with the adjusting pointer (10) (see Fig. 05-23/1).
- The mark on the spacer washer behind the camshaft sprocket should coincide with the mark on the 1st camshaft bearing bracket (see Fig. 05-27/1). If this is not the case, the camshaft sprocket must again be dismounted and the chain relocated.
21. Install and bleed the chain tightener (see Job No. 05-21).
 22. Install the inner guide rail (16) with holder (15) (see Fig. 05-23/1).
 23. Install the rocker arm brackets with rocker arms (see Job No. 05-5).
 24. Again check the adjustment of the camshaft with respect to the crankshaft (see Job No. 00-7, Section B).
 25. Mount the cylinder head cover (see Job No. 01-3).

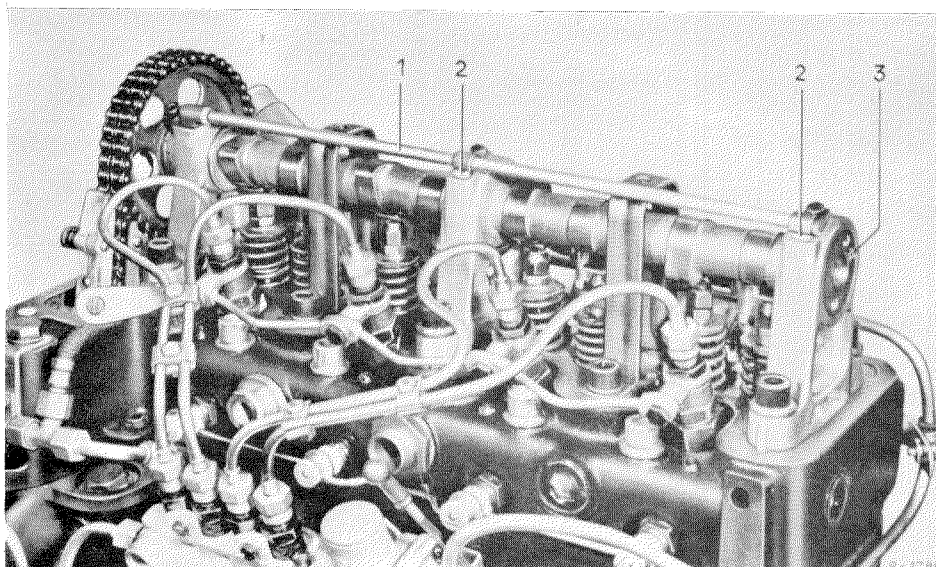
B. Camshaft External Lubrication

As already mentioned, the lubricating system for the camshaft and rocker arms was changed for the engines of model 190 Dc as from engine No. 621.912-10-062967 and for model L and O 319 D as from engine No. 621.913-10-015562. The engines have now an external camshaft lubrication and are provided with a new camshaft carrying the identification number 12 (Figure 05-36/2). It differs from the former camshaft (identification number 02) insofar that it has no center hole and no lubricating holes. In addition, the new camshaft has larger bearing pins 2 and 3, as well as new camshaft bearings (0.5 mm larger in diameter, now 46.5 mm dia.); it is provided with oil grooves or oil wells, respectively. The oil reaches the outer oil tube (1) (Figure 05-36/2) from the main oil duct via the oil hole (1) of the 1st camshaft bearing (Figure 05-36/3) and through the annular groove of the 1st camshaft bearing pin (Figure 05-36/5). From here, the camshaft bearings 2 and 3, the cams as well as rocker arms, are fed with dropping or centrifugal oil, respectively.

Figure 05-36/2

External
Camshaft Lubrication
Model 190 Dc

- 1 Oil tube
- 2 Oil well
- 3 Identification number



C. Subsequent Change to External Lubrication

Since the parts for **internal lubrication**

camshaft with identification No. 02	Part No. 621 0500201
set of camshaft bearings (former standard design)	Part No. 621 0500397
set of camshaft bearings	Part No. 621 0500497
Intermediate stage with a diameter 0.10 smaller	

are no longer available for model 180 Dc, model 190 Dc up to engine No. 621 91210062966, as well as for models L and O 319 D up to engine No. 621 91310015561, the engine must be changed to external lubrication in case of any repairs coming up. This may be done as follows:

- a) by installation of the camshaft carrying identification No. 12 as well as the parts of the following table.

Parts for Standard External Lubrication

Qty	Designation	Part No. or DIN Standards
1	Camshaft with identification No. 12	621 051 12 01
1	set of camshaft bearings, standard design	621 050 07 97
1	Oil tube	621 180 01 27
1	Hexagon socket screw M 6×15	DIN 912-8 G
1	Spring washer B 6	DIN 137
2	Clips A 8,2	DIN 71 434
2	Hexagon screws M 5×10	DIN 933-8 G
2	Spring washers B 5	DIN 137
In Case of Repairs		
1	Set of camshaft bearings, intermediate stage with a diameter smaller by 0.10 mm	621 050 08 97
1	Set of camshaft bearings, 1st repair stage with a diameter smaller by 0.25 mm	621 050 09 97

Note: In no case use camshaft bearings for internal lubrication for the camshaft carrying identification No. 12, since the lubrication would be insufficient.

- b) when using the former camshaft carrying identification No. 02, Part No. 621 0500201, already installed in the engine. This camshaft has to be changed from internal to external lubrication. Proceed as follows:

Plug oil holes on 1st camshaft bearing pin with aluminum plug 4.0 mm dia. and 8 mm length (Figure 05-36/4).

Note: The plugs should fit tightly in the oil holes and be sure that they do not protrude into the center hole of the camshaft, to prevent contacting the fastening bolt for the camshaft gear.

Regrind 1st bearing pin of camshaft to $\frac{34.875}{34.859}$ mm, the 2nd and 3rd bearing pin to $\frac{45.875}{45.859}$ mm and machine one annular groove on 1st bearing pin (Figure 4).

There is

1 Set of Camshaft Bearings, special design
for external lubrication 621 050 06 97

available for the reground and changed camshaft acc. to the above data.

The other parts required are similar to standard design.

For models **190 D and 190 Db**, provided with camshaft carrying identification 01 (internal lubrication), a change to external camshaft lubrication is not possible. For replacement use parts valid as before.

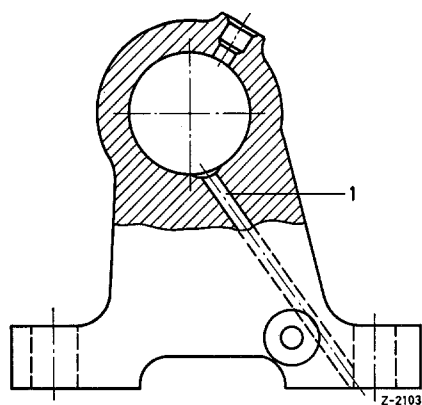


Figure 05-36/3

1st Camshaft Bearing
1 Oil hole for external lubrication

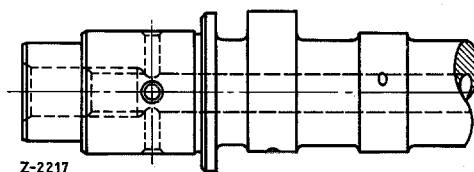


Figure 05-36/4

Camshaft for Internal Lubrication with
Oil Holes on 1st Camshaft Bearing Pin

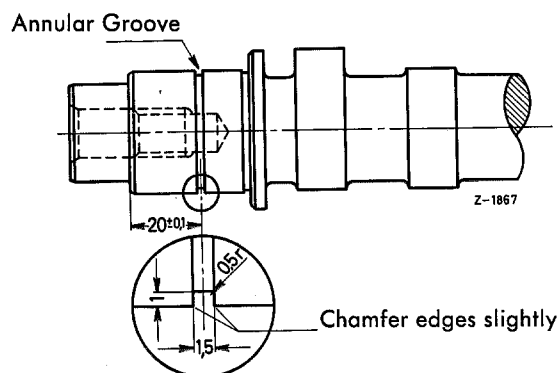


Figure 05-36/5

Camshaft for External Lubrication with Annular Groove on 1st Camshaft Bearing Pin