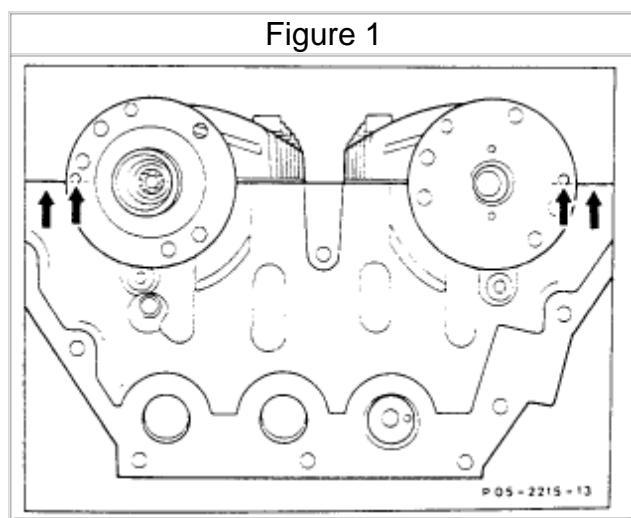


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The camshafts of this engine must be removed/installed with the utmost care. To avoid breaking of camshafts, the loosening and tightening specifications for [camshaft bearing caps](#), as well as the basic setting of camshafts in relation to ignition TDC of cylinder no. 1, must be observed with critical attention.

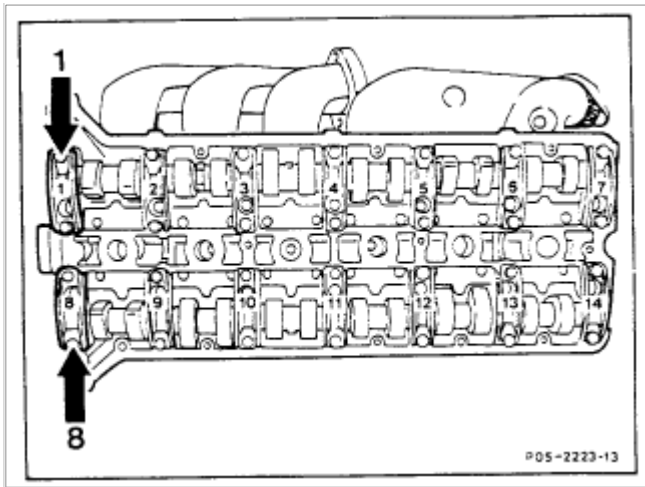
The following repair notes complement the Microfiche Repair Instructions, Engine 104, Mechanical, Group 05, job number 05-220 "Installing/removing camshafts". Please refer to the microfiche together with this service information.

Note :The camshafts must only be installed/removed in the basic position.

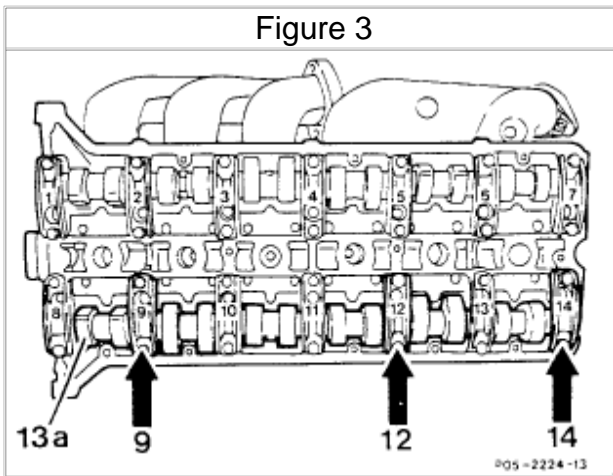
Basic Position

1. [Piston](#) of cylinder no. 1 at ignition TDC. The camshaft setting bores with 4 mm diameter (arrows) touch the upper edge of the cylinder head (both on the outside). Be sure the camshaft timing adjuster is in the retard position. (This is achieved by ensuring the engine is only rotated in the correct direction of rotation, never backwards, throughout the entire procedure) (Figure 1).

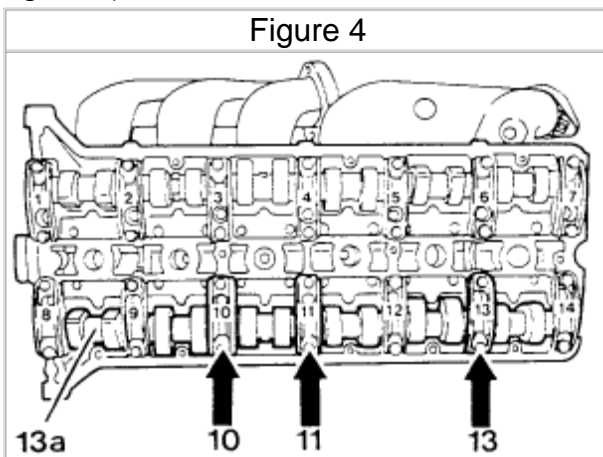
Figure 2

[Zoom](#)[Sized for Print](#)

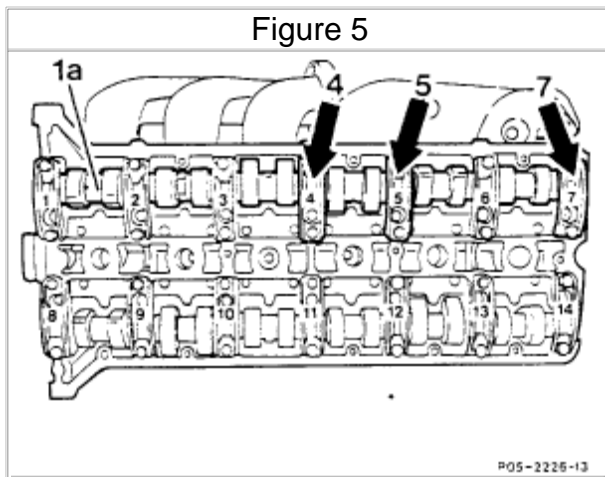
2. Remove [camshaft bearing](#) caps 1 and 8. (arrows) Remove thrust washers on camshafts with axial positioning at the front (Figure 2).

[Zoom](#)[Sized for Print](#)

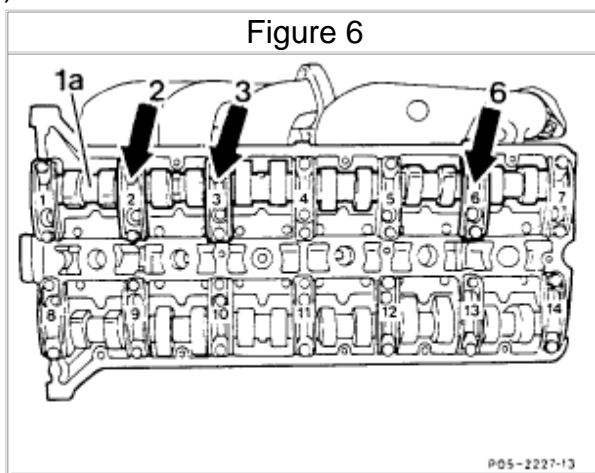
3. For removing the intake camshaft (13a), first remove bearing caps 9,12 and 14 (Figure 3).

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- Loosen screws of [camshaft bearing](#) caps 10, 11 and 13 alternately in steps of 1 turn each, until the [valve spring](#)'s upward pressure has been eliminated. Remove intake camshaft with [camshaft timing adjuster](#) attached (Figure 4). Remove thrust washers on camshafts with center axial positioning.

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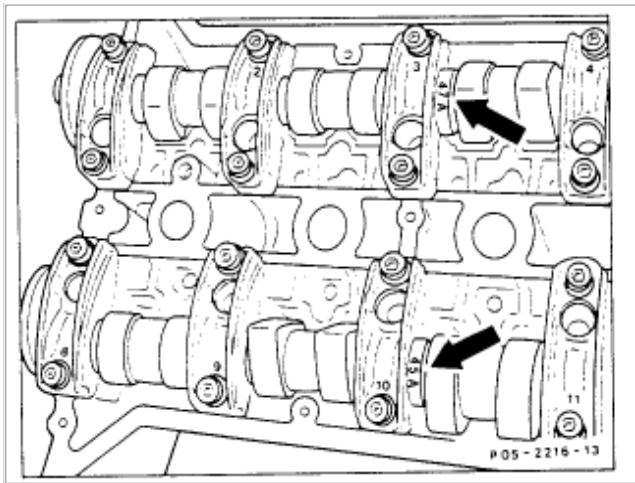
- For removing the exhaust camshaft (1a), first remove bearing caps 4, 5 and 7 (Figure 5).

[Zoom](#)[Sized for Print](#)

- Loosen screws of bearing caps 2, 3 and 6 alternately in steps of 1 turn each, until the [valve spring](#)'s upward pressure has been eliminated. Remove exhaust camshaft (Figure 6). Remove thrust washers on camshafts with center axial positioning.

Camshaft Installation

Figure 7

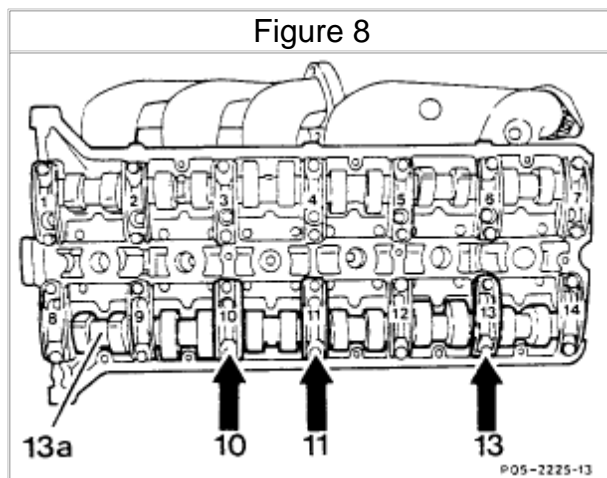


Zoom

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Note : Check valve tappets for correct seating and easy movement. Coat [camshaft bearings](#) and camshafts with oil. The camshaft identification number can be found at bearing points 3 and 10 (behind the bearing cap, arrows, Figure 7).

The letters behind the camshaft identification number are only a production inspection code.

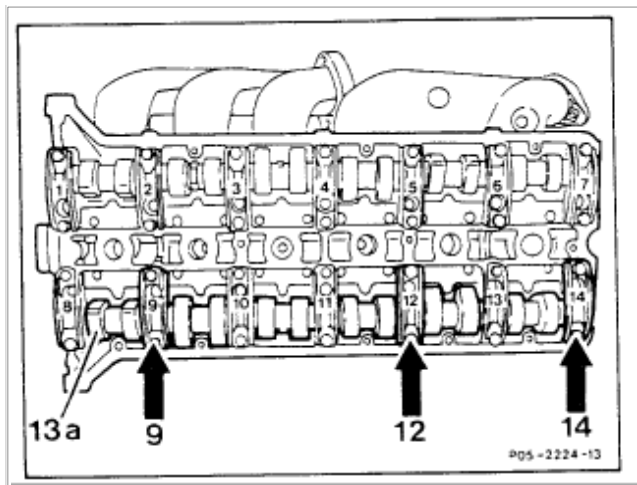


Zoom

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7. Insert intake camshaft (13a) in the cylinder head in such a way that the cam lobes on the 3rd cylinder point straight down. First install bearing caps 10, 11 and 13 and finger tighten bearing cap screws then tighten alternately in steps of 1 turn each. (Figure 8).

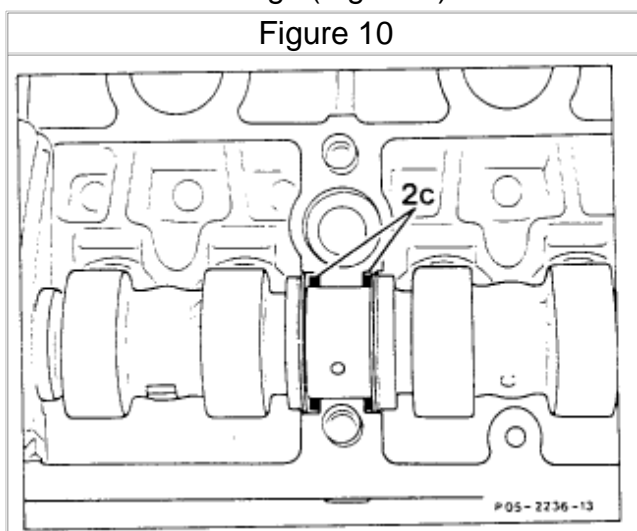
Figure 9



Zoom

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8. Align camshaft thrust washer grooves with grooves in cylinder head or bearing cap, and in the case of front axial positioning, install thrust washers. Install the other [camshaft bearing](#) caps. Pay attention to proper installation placement of the camshaft bearings (Figure 9).

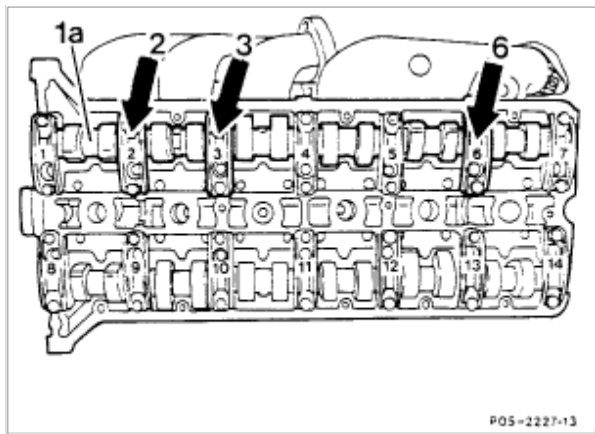


Zoom

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In the case of the intake camshaft with center axial positioning (Figure 10), the [camshaft bearing](#) cap (Figure 8, item 11) must be removed once again in order to fit the thrust washers (2c, Figure 10) after the camshaft has been aligned. Tightening torque of screws of the [camshaft bearing](#) caps in 21 Nm.

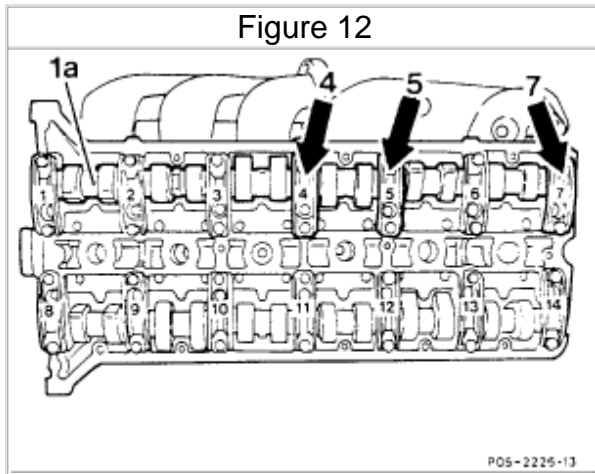
Figure 11



Zoom

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9. Insert exhaust camshaft into the cylinder head in such a way that the cam lobes on the cylinder no. 2 point straight down. First install bearing caps 2, 3 and 6 and finger tighten the screws of the [camshaft bearing](#) caps; then tighten the screws of the camshaft bearing caps alternately in steps of one turn each (Figure 11).



Zoom

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10. Align camshaft thrust washer grooves with grooves in cylinder head or bearing cap, and depending on the version, install thrust washers for the axial alignment of the camshaft. Install the remaining [camshaft bearing](#) caps. Pay attention to the installation placement of the camshaft bearings (Figure 12).

Note: The operations not described here must be taken from the Microfiche Repair Instructions Engine 104, Mechanical, Group 05, (operation no. 05-220).

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1995 Mercedes Benz E 320 Cabriolet (124 Chassis) L6-3199cc 3.2L DOHC (104)[Vehicle Level](#) → [Engine, Cooling and Exhaust](#) → [Engine](#) → [Camshaft](#) → [Service and Repair](#) → [Matching Camshafts and Mounting](#) ←

Matching Camshafts and Mounting

[Notes](#)

Matching Camshafts And Mounting

Timing In Degree Crank Angle (°CKA) At 2 mm Valve Lift [1] And New [Timing Chain](#)

Camshaft Code Number[2] :

21:

Inlet Opens ATDC [3] [5] : 36°

Inlet Closes ATDC [3] : 36°

23 [6] :

Inlet Opens ATDC [3] [5] : 36°

Inlet Closes ATDC [3] : 36°

43 [7] :

Inlet Opens ATDC [3] [5] : 36°

Inlet Closes ATDC [3] : 36°

45 [8] :

Inlet Opens ATDC [3] [5] : 36°

Inlet Closes ATDC [3] : 36°

33 [9] :

Inlet Opens ATDC [3] [5] : 36°

Inlet Closes ATDC [3] : 36°

34 [4] :

Inlet Opens ATDC [3] [5] : 36°

Inlet Closes ATDC [3] :	36°
19:	
Exhaust Opens BBDC:	30°
Exhaust Closes BTDC [5]	13°
24 [6] :	
Exhaust Opens BBDC:	30°
Exhaust Closes BTDC [5]	13°
41 [7] :	
Exhaust Opens BBDC:	30°
Exhaust Closes BTDC [5]	13°
47 [8] :	
Exhaust Opens BBDC:	30°
Exhaust Closes BTDC [5]	13°
35 [9] :	
Exhaust Opens BBDC:	30°
Exhaust Closes BTDC [5]	13°
36 [4] :	
Exhaust Opens BBDC:	30°
Exhaust Closes BTDC [5]	13°
57 [10] :	
Exhaust Opens BBDC:	30°
Exhaust Closes BTDC [5]	13°
59 [11] :	
Inlet Opens ATDC [3] [5]	34°
Inlet Closes ATDC [3]	34°
60 [4] :	
Inlet Opens ATDC [3] [5]	34°

Inlet Closes ATDC [3] 34°

57:

Exhaust Opens BBDC: 31°

Exhaust Closes BTDC [5] 14°

58 [4] :

Exhaust Opens BBDC: 31°

Exhaust Closes BTDC [5] 14°

65:

Exhaust Opens BBDC: 31°

Exhaust Closes BTDC [5] 14°

66 [4] :

Exhaust Opens BBDC: 31°

Exhaust Closes BTDC [5] 14°

[1]: permissible difference $\pm 2.0^\circ$ CKA

[2]: camshaft code number on 3rd [camshaft bearing](#) or stamped on camshaft flange from rear with paint

[3]: Camshaft adjuster in "retarded" position.

[4]: Repair size camshaft with 0.5 mm larger bearing diameter.

[5]: These reading can be obtained at the vibration damper.

[6]: Shaft diameter 30 mm since 8/89

[7]: Modified cam shape with steel bucket tappet since 8/89.

[8]: Center axial location since 11/89.

[9]: Modified cam shape since 2/90.

[10]: Since 04/91.

[11]: Since 03/91.

Test Data

[Camshaft Bearing](#) Diameter:

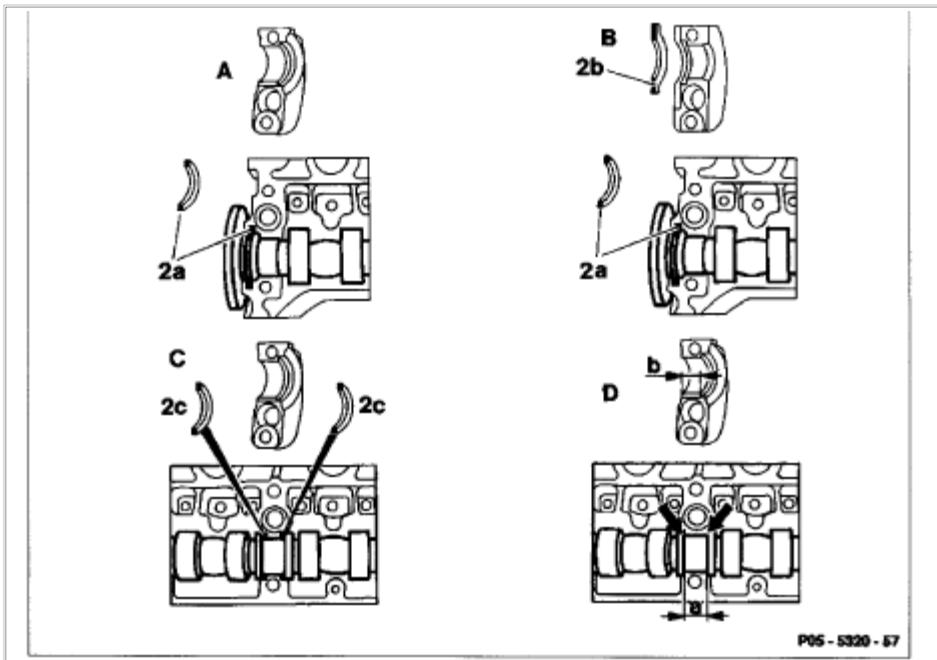
Repair Size: **29.947 - 29.960 mm**

Standard Size: **29.947 - 29.960 mm**

[Camshaft Bearing](#) Play:

Axial: **0.060 - 0.210 mm**

Radial: **0.040 - 0.074 mm**



P05 - 5320 - 57

- 2a Bottom thrust washer 104 051 01 73
- 2b Top thrust washer 104 051 00 73
- 2c Bottom thrust washer 120 051 00 73

A	Thrust washer at bearings 1 and 8 in bearing halves of cylinder head			Up to engine end no.
	Bottom thrust washer	104 051 01 73		104980 10 000060
	Front bearing cap	Inlet 104 051 13 03		104980 12 000053
	Front bearing cap	Exhaust 104 051 11 03		104981 10 000019 104981 12 000074
B	Two thrust washers each at bearings 1 and 8 in the bearing halves of cylinder head and in the camshaft bearing caps			As of engine no. Up to engine end no.
	Bottom thrust washer	104 051 01 73	104980 10 000061	104980 10 000718
	Top thrust washer	104 051 00 73	104980 12 000054	104980 12 003032
	Front bearing cap	Inlet 104 051 20 03	104981 10 000020	104981 10 000157
	Front bearing cap	Exhaust 104 051 18 03	104981 12 000075	104981 12 000915
C	Two thrust washers each at bearings 4 and 11 in bearing halves of cylinder head			As of engine no. Up to engine end no.
	Thrust washer	120 051 00 73	104980 10 000719	104980 10 004091
	Front bearing cap	Inlet 104 051 13 03	104980 12 003033	104980 12 017952
	Front bearing cap	Exhaust 104 051 11 03	104981 10 000158 104981 12 000916	104981 10 000789 104981 12 007762
D	Without thrust washers at bearings 4 and 11 in bearing halves of cylinder head			As of engine no. Engine 104990
	Front bearing cap	Inlet 104 051 37 03	104980 10 004092	
	Front bearing cap	Exhaust 104 051 35 03	104980 12 017953 104981 10 000790 104981 12 007763	

Zoom

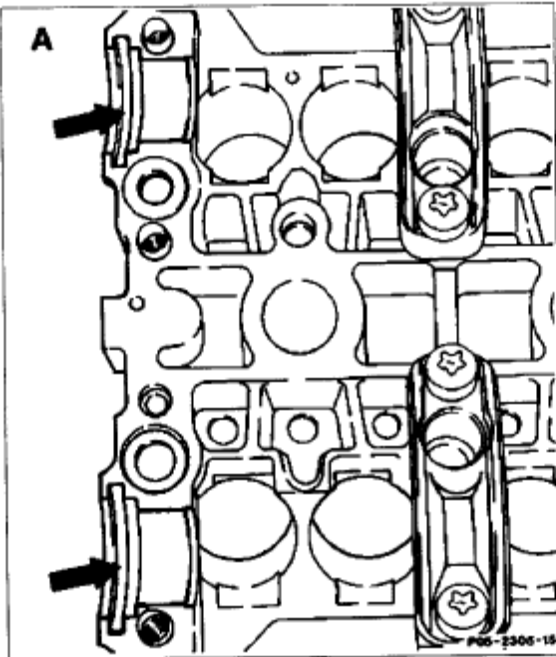
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Decision table engine 104.98				
	Camshaft axial mounting			
Bucket tappet				
Carbide metal	A 1)	B 2)	-	-
Steel	-	B	C	D
Camshafts				
Standard 21/19	A	-	-	-
Repair 33/35	-	-	C 2)	D 3)
Camshafts				
Standard 23/24, 43/41	-	B	-	-
Repair 33/35	-	-	C 3)	D 4)
Camshafts				
Standard 45/47	-	-	C	-
Repair 33/35	-	-	C	D 4)
Camshafts				
Standard 33/35, 57/59 5)	-	-	-	D
Repair 33/35 6) 57/59 65	-	-	-	D
<p>1) May only be fitted with camshafts with code numbers 21/19. 2) May only be fitted with camshafts with code numbers 23/24. 3) Together with cylinder head 104 010 10 20 4) Together with cylinder head 104 010 21 20 5) As of engine 980 10/50, 20/60 005792 980 12/52, 22/62 025654 981 10/50, 20/60 001134 981 12/52, 22/62 010894 6) Up to engine 980 10/50, 20/60 005791 980 12/52, 22/62 025653 981 10/50, 20/60 001133 981 12/52, 22/62 010893</p>				

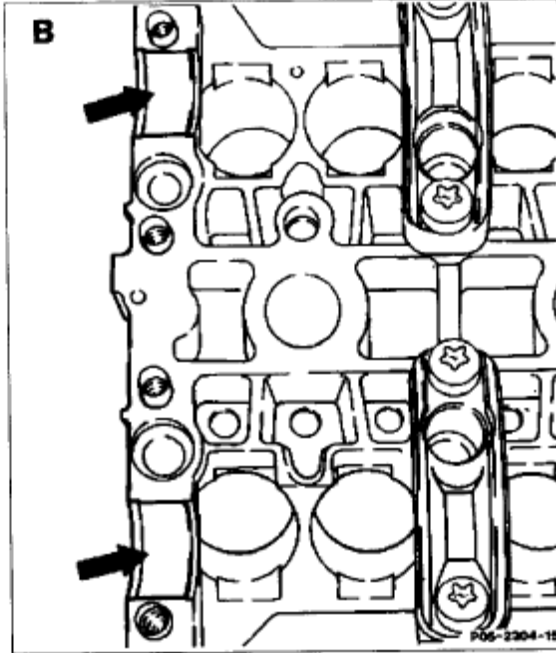
Zoom

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Note



Engine 104.98 up to 11/90
Cylinder head with thrust shoulder for axial mounting of camshafts at front (arrows).



Engine 104.98 as of 11/90
Engine 104.99
Cylinder head without thrust shoulder for axial mounting of camshafts at front (arrows).

Zoom

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 Conversion Calculator**1995 Mercedes Benz E 320 Cabriolet (124 Chassis) L6-3199cc 3.2L DOHC (104)**[Vehicle Level](#) → [Engine, Cooling and Exhaust](#) → [Engine](#) → [Camshaft](#) → [Service and Repair](#) → [Removing and Installing Camshafts](#) ←

Removing and Installing Camshafts

[Notes](#)

Removing and installing camshafts

Preliminary Work

[Cylinder head cover](#) removed. Refer to [Cylinder Head Assembly - Valve Cover - Service and Repair - Procedures](#) [See: Valve Cover\Service and Repair](#)

NOTE: Numbers in parentheses () indicate a component or tool in the associated illustration.

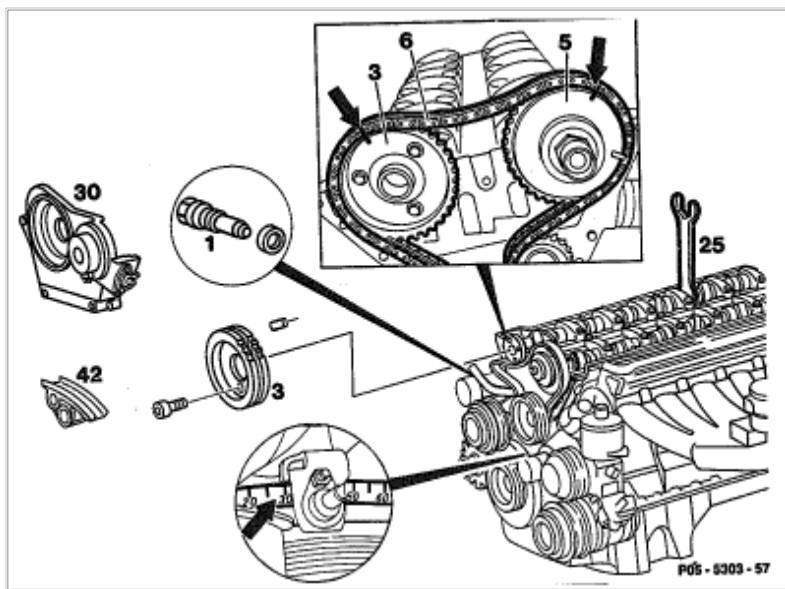
The [camshaft bearing](#) caps must be reinstalled at the same point (as their original location).

The inlet camshaft can be removed and installed with or without the camshaft sprocket.

Removal

1. Rotate [crankshaft](#) to **30°BTDC** of cylinder 1 (arrow).

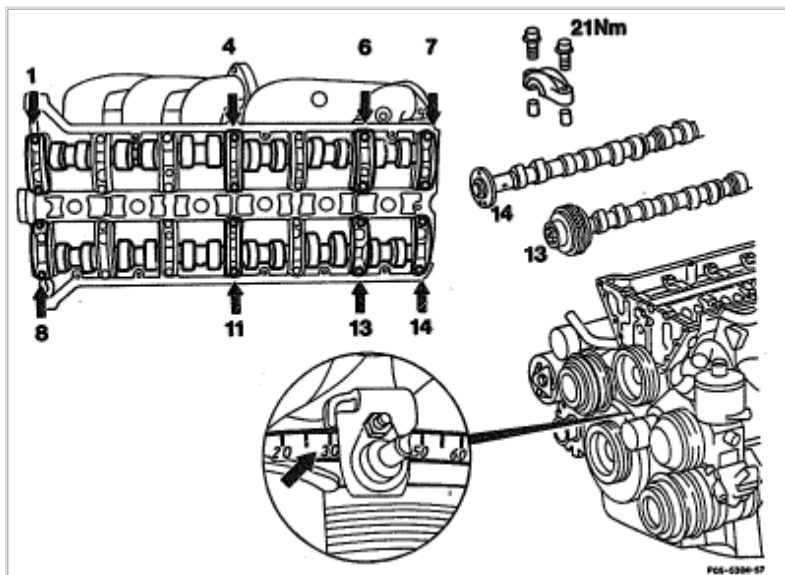
NOTE: At 30° BTDC of cylinder 1 the camshafts can be rotated without the valves touching the [piston](#) crowns.



Zoom

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2. Remove chain tensioner (1). Refer to [Timing Components - Timing Chain Tensioner - Service and Repair - Procedures - Removing and Installing Chain Tensioner](#)
See: [Timing Chain Tensioner\Service and Repair](#)
3. Remove front cover (30) and top guide rail (42). Refer to [Timing Components - Timing Cover - Service and Repair - Procedures](#) See: [Timing Cover\Service and Repair](#)
4. Mark camshaft sprockets (3) and (5) together with [timing chain](#) (6) (arrows).
5. Unbolt exhaust camshaft sprocket (3).
6. Lift [timing chain](#) (6) off at inlet camshaft sprocket (5).
7. Turn camshafts with wrench (25) tool No. 104 589 00 01 00 (WAF 27) or tool No. 104 589 01 01 00 (WAF 29), so that the lobes of the cams of cylinder 2 press on the middle of the bucket tappets.



Zoom

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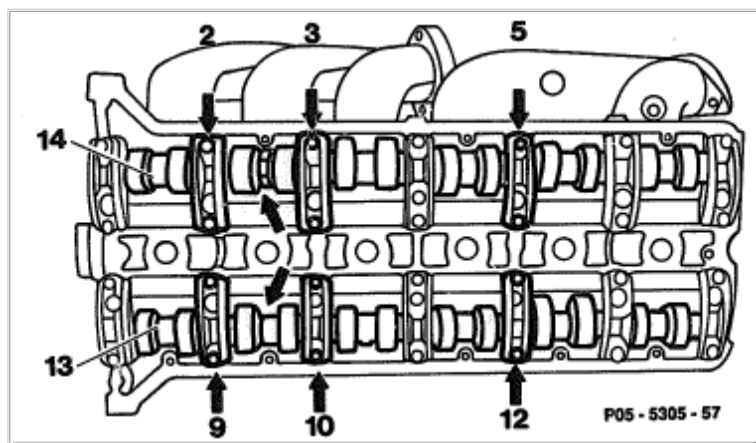
8. Unbolt [camshaft bearing](#) caps (1), (4), (6) and (7) of exhaust camshaft (14) and bearing caps (8), (11), (13) and (14) of inlet camshaft (13). Engine 104.98: Remove thrust washers of [camshaft bearing](#) caps (1) and (8), (4) and (11). Refer to **Matching Camshafts and Mounting** [See: Matching Camshafts and Mounting](#)
9. Slacken bolts of remaining [camshaft bearing](#) caps in steps of one turn until counter-pressure is eliminated.

CAUTION: Camshafts (13) and (14) must not be twisted when slackening or bolting on the [camshaft bearing](#) caps.

10. Take off inlet camshaft (13) and exhaust camshaft (14).

Installation

1. Check the bucket tappets for ease of movement.
2. Oil all bearing points and bucket tappets.



Zoom

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3. Insert inlet camshaft (13) and exhaust camshaft (14) into bearing points at **30° BTDC** of cylinder 1, align axially. The lobes of the cams must be facing down centered at cylinder 2 (arrows).
4. Install [camshaft bearing](#) caps (2), (3) and (5) of exhaust camshaft (14) and bearing caps (9), (10) and (12) of inlet camshaft (13).

NOTE: Since 01.93 the [camshaft bearing](#) caps are no longer fixed in position with dowel sleeves but bearing caps are centered automatically over the bearing points of the camshafts when the securing bolts are tightened as specified.

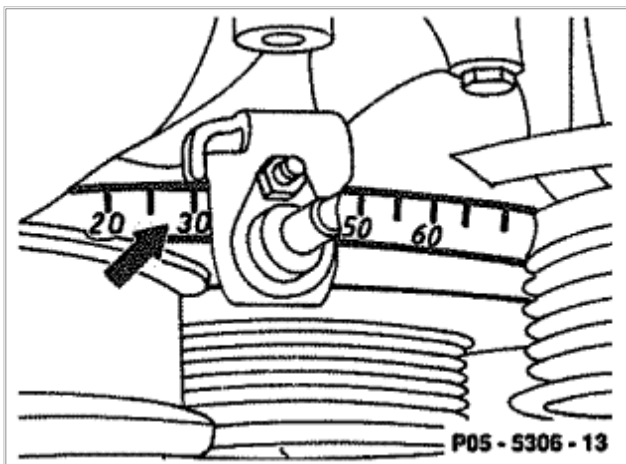
5. Screw bolts of camshaft caps in steps each of one turn alternately, tighten to **21 Nm** .

CAUTION: Camshafts (13) and (14) must not be twisted when bolting on the [camshaft bearing](#) caps.

6. Hold camshafts with wrench (25) tool No. 119 589 00 01 00 or 104 589 01 01 00, when bolting on [camshaft bearing](#) caps so that the lobes of the cams at cylinder 2 are facing down centered (arrows). Engine 104.98: Install thrust washers of [camshaft bearing](#) caps (1) and (8), (4) and (11) Refer to **Matching Camshafts and Mounting** See: [Matching Camshafts and Mounting](#)
7. Install remaining [camshaft bearing](#) caps and tighten to **21 Nm** .
8. Install exhaust camshaft sprocket.
9. Fit [timing chain](#) onto camshaft sprockets; pay attention to colored markings.

NOTE: If no colored markings are provided, adjust to basic position of camshafts.

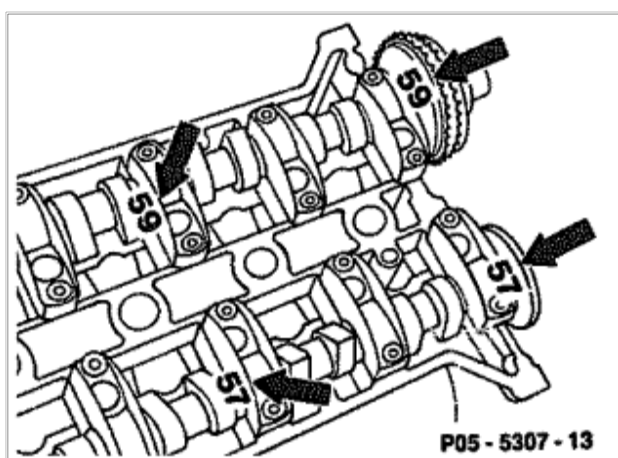
10. Install front cover and top guide rail. Refer to [Timing Components - Timing Cover - Service and Repair - Procedures](#) See: [Timing Cover\Service and Repair](#)
11. Install chain tensioner. Refer to [Timing Components - Timing Chain Tensioner - Service and Repair - Procedures - Removing and Installing Chain Tensioner](#) See: [Timing Chain Tensioner\Service and Repair](#)
12. Check basic position of camshafts. Refer to **Adjusting Basic Position of Camshafts** See: [Adjustments](#) **CAUTION:** The camshafts are sensitive to fracturing and must not be subjected to stresses when being removed and installed.



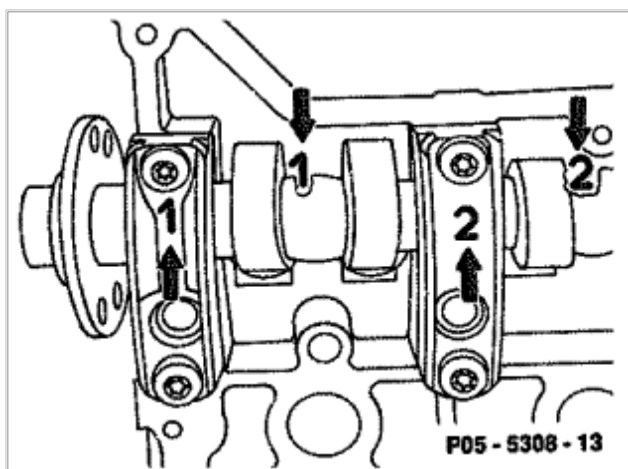
Zoom

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NOTE: When the [crankshaft](#) is in the 30°BTDC at cylinder 1 the camshafts can be rotated without the valves touching the [piston](#) crowns.

[Zoom](#)[Sized for Print](#)

The camshaft code numbers are affixed in each case to the third [camshaft bearing](#) journal at the rear (arrows) (behind the camshaft bearing caps) or stamped with paint on the camshaft flanges (arrows).

[Zoom](#)[Sized for Print](#)

The [camshaft bearing](#) caps are identified with numbers (arrows). The numbering (arrows) of the camshaft bearing caps are also cast in the cylinder heads.