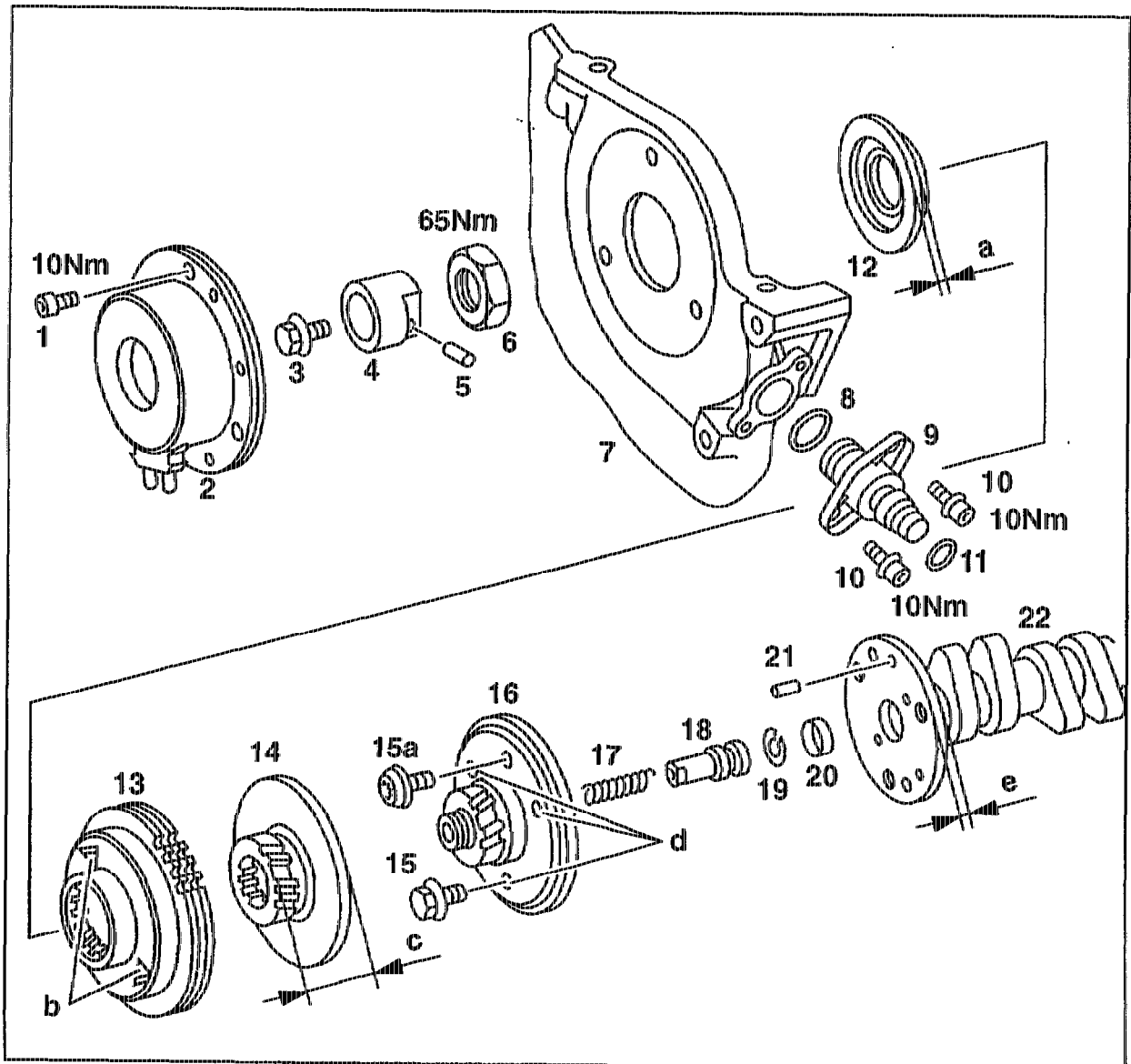


05-2160 Function of camshaft adjuster




P05-5401-59

- | | | | |
|----|---|-----|---|
| 1 | M6 × 18 bolt | 15 | Bolt + washer (see 05-2180) |
| 2 | Servo magnet with 2-pin connector | 15a | Collar bolt (see 05-2180) |
| 3 | Bolt | 16 | Flanged shaft (1st version: d with recess)
(2nd version: d without recess) |
| 4 | Armature | 17 | Compression spring |
| 5 | 3 × 22 roll pin in armature | 18 | Control plunger |
| 6 | M20 × 1.5 nut, WAF 30 | 19 | 18 × 1 circlip |
| 7 | Front cover | 20 | End cover A18 oil drilling |
| 8 | Seal | 21 | Straight pin in camshaft |
| 9 | Ignition control module position sensor | 22 | Inlet camshaft
(size e see 05-2180) |
| 10 | M6 × 16 bolt + washer | | |
| 11 | Seal | | |
| 12 | Cover with seal | | |
| 13 | Camshaft sprocket with position indicator (b) | | |
| 14 | Positioning piston
(1st version: size c = 25.45 mm)
(2nd version: size c = 25.9 mm) | | |

Function

When the engine is running, the camshaft adjuster rotates the inlet camshaft hydraulically/mechanically relative to the camshaft sprocket by 34° (29°)¹⁾ (engine 104.98) or 32° (engine 104.99) crank angle, respectively, to the "advanced" position and back to the "retarded" position. The camshaft adjuster is actuated electromechanically by the CFI or LH-SFI control module. The positioning time of approx. 1 second is dependent on the engine oil pressure at the camshaft adjuster and on the oil viscosity and oil temperature, respectively. The position indicator on the camshaft sprocket (13) provides the camshaft rotational speed to the position sensor (9) as an input parameter for the ignition control module or, on engine 104.99, for the LH-SFI control module.

1) As of approx. 04/91 except 

Engine switched off ("retarded")

The compression spring (17) pushes the control plunger (18) against the circlip (19). The engine oil pressure in the camshaft adjuster is eliminated.

From 0 to 1000 → 2000/min ("retarded")

The torque of the internally helically toothed camshaft sprocket (13) acting in the direction of rotation of the engine pushes the externally helically toothed positioning piston (14) against the cover (12) as a result of the screw action. Consequently, the likewise internally helically toothed positioning piston (14) holds the externally helically toothed flanged shaft (16) together with the bolted-on camshaft (22) in the "retarded position". The compression spring (17) pushes the control plunger (18) against the circlip (19). The engine oil flows through two oblique drillings in the camshaft flange and in the flanged shaft (16) into the working chamber (A) and holds the positioning piston (14) additionally in the "retarded" position with the available engine oil pressure.

Leak oil flows off over control and positioning piston surface, through the control plunger drilling and 2 drillings (23) in the camshaft flange.

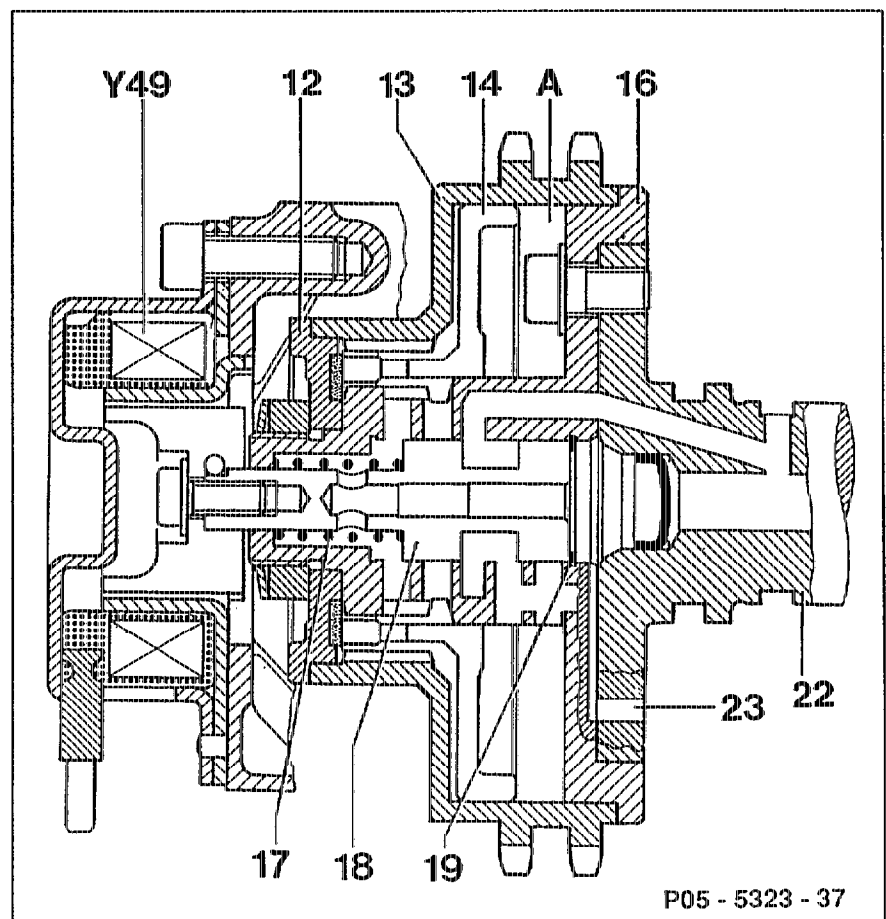
"Retarded" position

Servo magnet (Y49) not energized.

Control plunger (18) against rear stop.

Positioning piston (14) against front stop. Oil pressure in working chamber (A).

- A Working chamber
- 12 Cover with ring
- 13 Camshaft sprocket
- 14 Positioning piston
- 16 Flanged shaft
- 17 Compression spring
- 18 Control plunger
- 19 18 x 1 circlip
- 22 Camshaft
- 23 Oil outlet drilling
- Y49 Servo magnet with 2-pin connector



P05 - 5323 - 37

From 1000 → 2000 to 5000/min ("advanced")

The control plunger (18) is pulled forward as far as the stop in the flanged shaft (16) by the servo magnet (Y49) against the force of the compression spring (17).

The control plunger (18) closes the oil feed to the working chamber "A" and at the same time allows oil to flow to the working chamber "B" through 2 drillings each in the flanged shaft (16) and adjusting piston (14). The engine oil pressure moves the adjusting piston (14) as far as the stop on the flanged shaft (16).

As a result of the axial movement of the adjusting piston (14), the camshaft (22) bolted to the flanged shaft (16) is turned into the "advanced" position. The turning action is achieved as a result of the effect of the helical teeth on the camshaft sprocket (13), positioning piston (14) and flanged shaft (16). The engine oil in working chamber "A" flows off, assisted by the pushing action of the adjusting piston (14), over the flanged shaft (16) and through 2 drillings (23) in the camshaft flange.

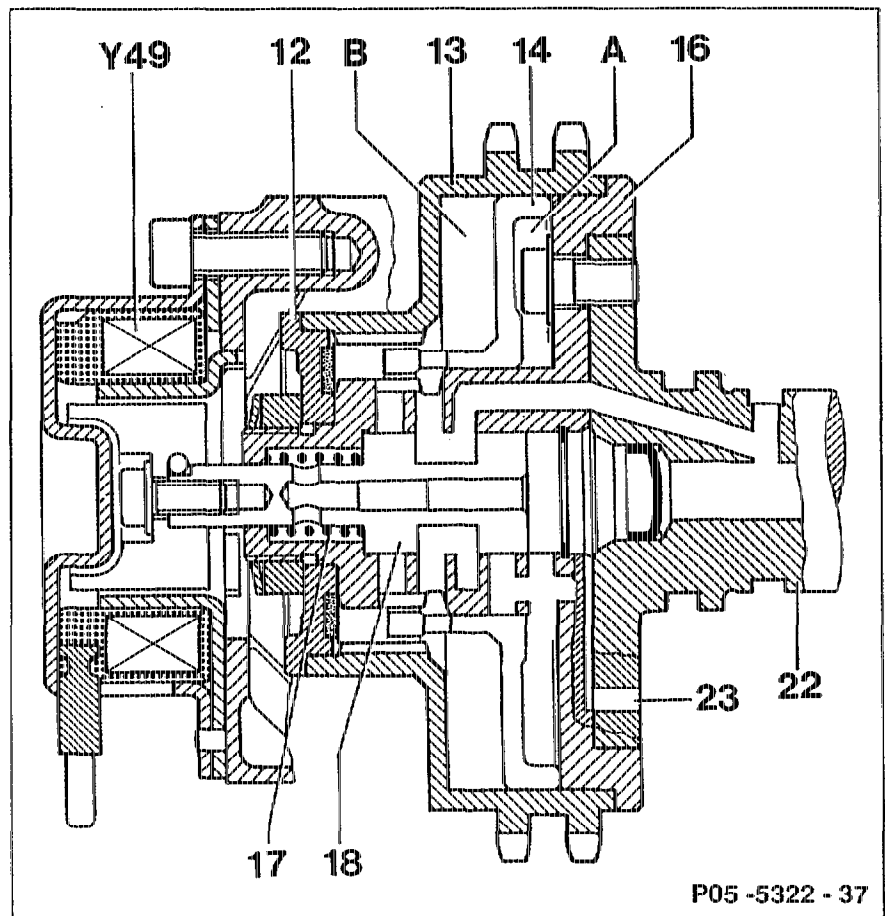
"Advanced" position

Servo magnet (Y49) energized.

Control plunger (18) against front stop.

Positioning piston (14) against rear stop. Oil pressure in working chamber (B).

- A Working chamber
- B Working chamber
- 12 Cover with ring
- 13 Camshaft sprocket
- 14 Positioning piston
- 16 Flanged shaft
- 17 Compression spring
- 18 Control plunger
- 19 18×1 circlip
- 22 Camshaft
- 23 Oil outlet drilling
- Y49 Servo magnet with 2-pin connector



P05 -5322 - 37

From 5000/min ("retarded")

The electromagnetic actuator (Y49) is not energized and allows the control plunger to move. The compression spring (17) pushes the control plunger (18) against the circlip (19). The oil feed to the working chamber "B" is closed off and oil is able to flow to working chamber "A" along

2 drillings in the flanged shaft (16). As a result of the engine oil pressure the control plunger (18) is moved as far as the cover (12).

This axial movement of the adjusting piston (14) rotates the camshaft (22) bolted to the flanged shaft (16) into the "retarded" position.

The rotational movement is a result of the screw effect of the helical teeth on the camshaft sprocket (13), positioning piston (14) and flanged shaft (16). The engine oil in the working chamber (B) flows off, assisted by the pushing action of the adjusting piston (14), through 2 drillings each in the adjusting piston (14), flanged shaft (16) and control plunger (18) through the control plunger (18) and 2 drillings in the camshaft flange (23).

Leak oil flows off over the control plunger and adjusting piston surfaces through the control plunger drilling and 2 drillings in the camshaft flange (23).