

Timing in degree (°) crankshaft with 2 mm valve lift

Camshaft code number ¹⁾ left/right	Engine	Engine special version No.	Intake valve opens ATDC ²⁾
02/03	117.960	—	12° (10°)
04/05	117.961	—	20° (18°)
08/09	116.964 116.965 117.962 117.963 117.964 117.965	012.468/01	22° (20°)
14/15	117.963	012.406/10	18° (16°)
16/17	117.968	012.480/01	17° (16°)
18/19	117.967 117.968	012.468/05 012.468/06 012.468/14 012.468/15	27° (26°)
20/21	116.965 117.965	—	21° (20°)
24/25	117.968 RÜF		17° (16°)
26/27	117.967 117.968 CAT	012.468/05 012.468/06 012.468/14 012.468/15	27° (26°)
60/61	116.960 116.961 116.962 116.963	012.406/03 012.406/04 012.406/07 012.406/08	12° (10°)
62/63	116.960 116.961 116.962 116.963	012.406/01 012.406/02 012.406/05 012.406/06	24° (22°)
70/71	116.962 116.963 116.964 116.965	012.468/03 012.468/04	16° (14°)

¹⁾ Camshaft code number association can be taken from the spare part microfilms.

²⁾ With new timing chains and a running time of below 20 000 km, adjust the timing of the right-hand camshaft according to the values in brackets.

Tightening torques

Nm

Bolts for cylinder head cover

3

Bolts for camshaft sprockets M 14 x 1.5 x 40

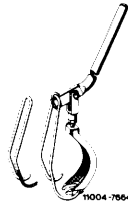
100

Hydraulic valve clearance compensating elements in cylinder head

60

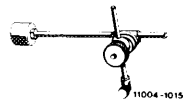
Special tools

Spring compressor for valve spring



123 589 03 61 00

Dial gauge holder



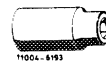
363 589 02 21 00

Valve clearance wrench 17 mm



116 589 02 01 00

Socket insert 27 mm



001 589 65 09 00

Square drive



617 589 00 16 00

Conventional tool

Dial gauge A 1 DIN 878

e.g. Mahr, D-7300 Esslingen
Order No. 810

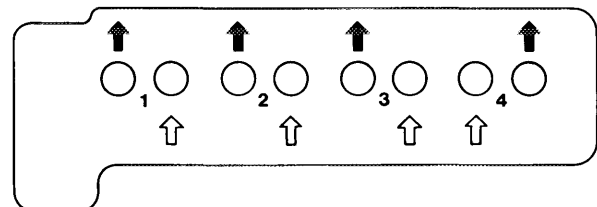
Note

During assembly jobs it is sufficient if the marks on the camshafts coincide at ignition TDC position of 1st cylinder.

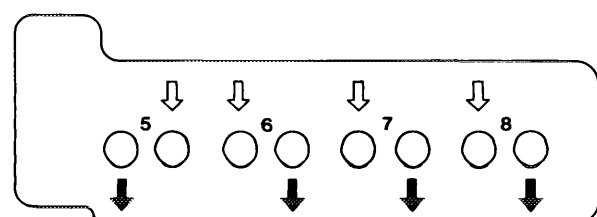
Check „intake valve opens“ on 1st and 6th cylinder at 2 mm valve lift.

Checking

1 Check camshaft code number on rear end of camshafts.



⚡ 1 5 4 8 6 3 7 2



2053-4199

2 Remove rocker arm (1) and valve clearance compensating elements (2) on intake valve of 1st and 6th cylinder. Install valve adjusting screw (1), part No. 116 050 11 20, on intake valve of 1st and 6th cylinder instead of compensating elements (2). Install rocker arm.

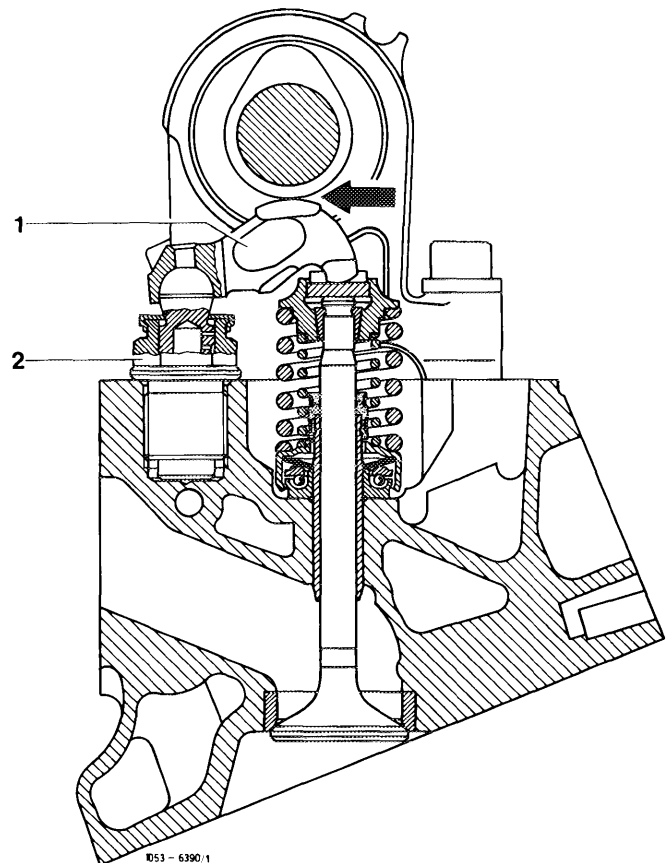
Caution!

The rocker arms and the valve clearance compensating elements should be installed in the place from which they were removed.

3 Rotate crankshaft (27 mm socket) until the cam tip rests against intake valve of 1st cylinder in upward position.

Rotate crankshaft in engine direction of rotation only.

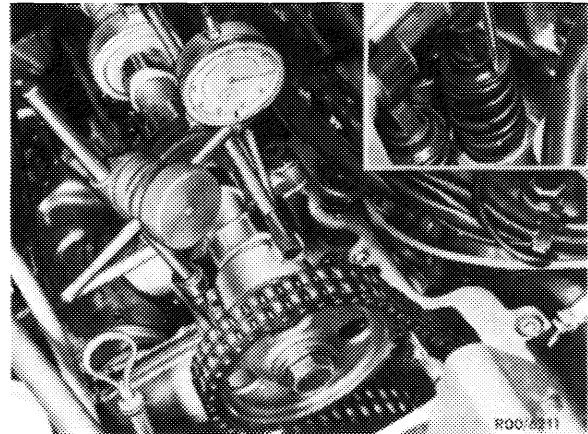
4 Turn valve adjusting screw until rocker arm rests free of play against camshaft heel (arrow).



5 Attach dial gauge holder to cylinder head.

6 Clamp dial gauge with extension pin in dial gauge holder with a preload of 3 mm.

The measuring pin should rest on the valve spring retainer in an accurately vertical position.



7 Set the large pointer to 0.

8 Rotate crankshaft until the pointers of the dial gauge return by 2 mm to a preload of 1 mm. The valve lift will then be 2 mm.

9 In this engine position the value on the vibration damper should be in agreement with the value „Intake valve opens“ in the table.

10 Perform this test on the intake valve of 6th cylinder by repeating figures 4 to 9.

Adjusting

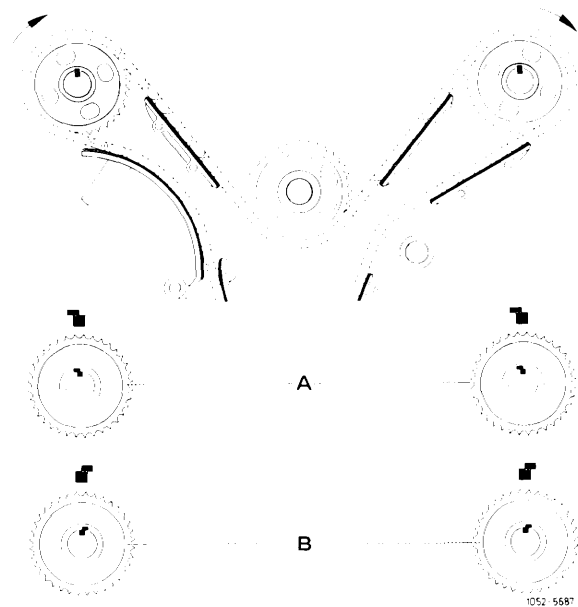
If the timing must be corrected, install an offset Woodruff key or if the chain has been elongated too much, a new timing chain.

Woodruff keys are available in the following steps:

Offset mm	Part No.	For a correction of approx.
0.7	621 991 04 67	4° crank angle
0.9	621 991 02 67	6 1/2° crank angle
1.1	621 991 01 67	8° crank angle
1.3	621 991 00 67	10° crank angle

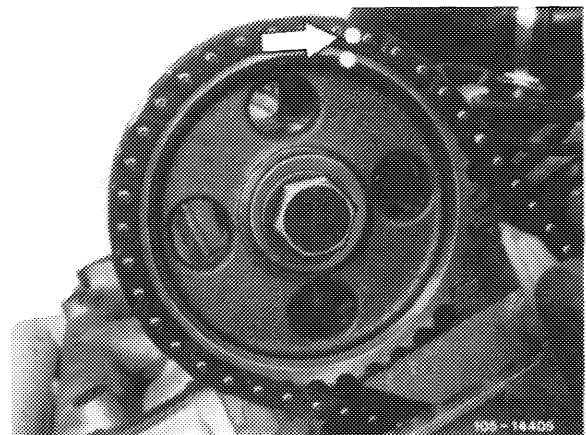
An offset by one tooth on the camshaft sprocket results in approx. 18° on the crankshaft.

An offset of the Woodruff key to the right (in the direction of driving) results in an earlier commencement of opening, while an offset to the left results in a later commencement of opening.



Installation position A results in earlier commencement of opening
Installation position B results in later commencement of opening

- 11 Mark camshaft sprockets and timing chain relative to each other (arrow).
- 12 Remove the respective camshaft sprocket.
- 13 Place a rag under the camshaft and remove the Woodruff key.
- 14 Insert the selected Woodruff key.
- 15 Install the camshaft sprocket while paying attention to the color coding.



The wide collar on the camshaft sprocket should face to the camshaft (arrow).

Do not tighten the bolt.

- 16 Repeat items 4 to 9.
- 17 Tighten bolt to 100 Nm.
- 18 Check basic position of hydraulic valve clearance compensating elements and correct (05-213).
- 19 Complete the engine.

