

**ADVERTENCIA**

Al imprimir se corre el riesgo de perder la correcta asignación de las figuras al texto.

- Por motivos técnicos, por el momento no se puede descartar que, aun siendo correcta la imagen que aparezca en la pantalla, al imprimir se pierda la correlación entre el texto y la figura correspondiente.
- Si este error pasara desapercibido, existe el riesgo de que los trabajos no se ejecuten de forma correcta y, por tanto, se produzcan daños personales y materiales.

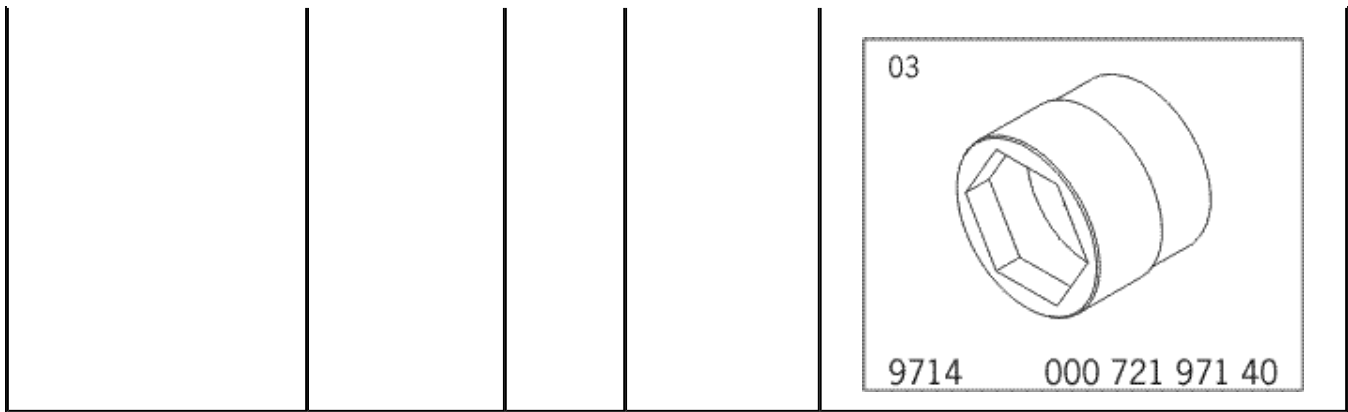
→ Por ello le rogamos que tras el proceso de impresión compare siempre las copias impresas con la imagen de la pantalla. En caso de error, corrija las copias impresas de forma que se correspondan con el contenido de la imagen de la pantalla.

## 15 05 16 Adjusting the timings for the camshafts - as of MY 2003

- Preliminary work
- Tools and materials
- Adjusting the timings for the camshafts
- Subsequent work

### Tools

Designation	Type	Number	Explanation	
fixing pins	special tool	9595/1		
Camshaft guide	special tool	9678		
socket wrench insert	special tool	9714		



## Preliminary work

### Preliminary work



#### Note

- To remove the play from the timing chain for the setting process, the crankshaft must be positioned at least 45° in front of the TDC of cylinder 1 before turning!

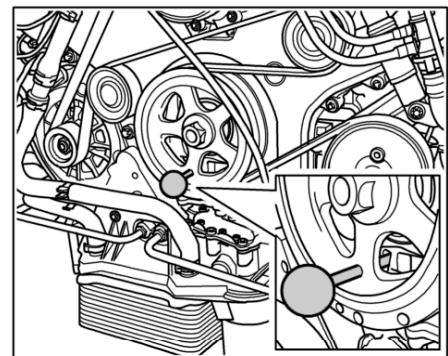
1. Remove camshaft housing cover on both cylinder rows → 159121 Removing camshaft housing cover - Chapter "Removing".



#### ATTENTION

#### Damage to engine by turning crankshaft against the rotation direction of the engine (engine assembled)!

- Never rotate crankshaft against the operating direction if the timing drive mechanism is mounted (timing chain jumps over).
- Proceed carefully while working as otherwise the engine can be damaged.
- Always turn the engine on the crankshaft and never on the camshaft as the timing chain may jump over.
- After working on the camshaft wheels, the timing must be set.
- Please observe the general warning notes and working regulations → 1001AW The most important working regulations and warning notes



Fixing pin in crankshaft gearwheel



#### Note

- The setting is always checked simultaneously on both cylinder rows. Once a cylinder row has been set, the crankshaft must not be turned to set the other cylinder row!
- The fastening screws on the sprocket wheels do not need to be replaced after they have been undone.
- The screws on the sprocket wheels are tightened by hand during assembly and are then loosened by one or

two turns. This play is necessary so that the camshafts can still be turned.

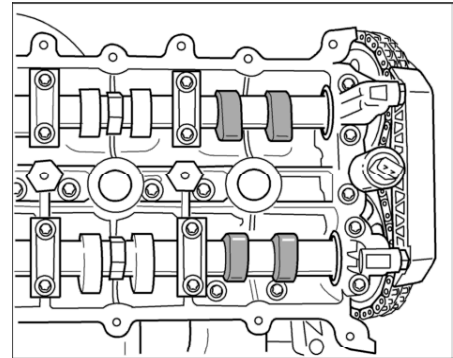
- The setting is carried out with the standard chain tensioner that is installed.
2. Use **socket wrench insert 9714** to turn crankshaft until cylinder 1 is in ignition TDC. Insert **fixing pins 9595/1** into the relevant groove in the timing chain housing cover through the bore provided in the crankshaft gearwheel -see figure- .



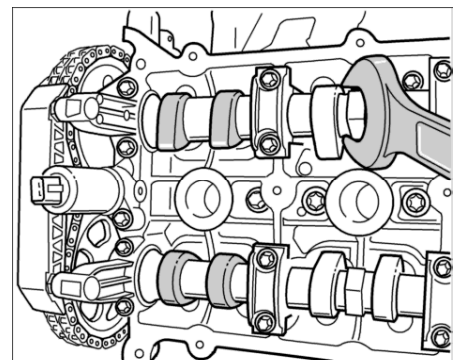
#### Note

*If the cams on cylinder 1 are not positioned as shown, check whether the crankshaft needs to be turned through another turn (360°)!*

3. Make sure that the cams of cylinders 1 and 5 are positioned as shown (ignition TDC cylinder 1) → [Cams of cylinder 1](#) → [View shows position of cams on cylinder 5](#) .



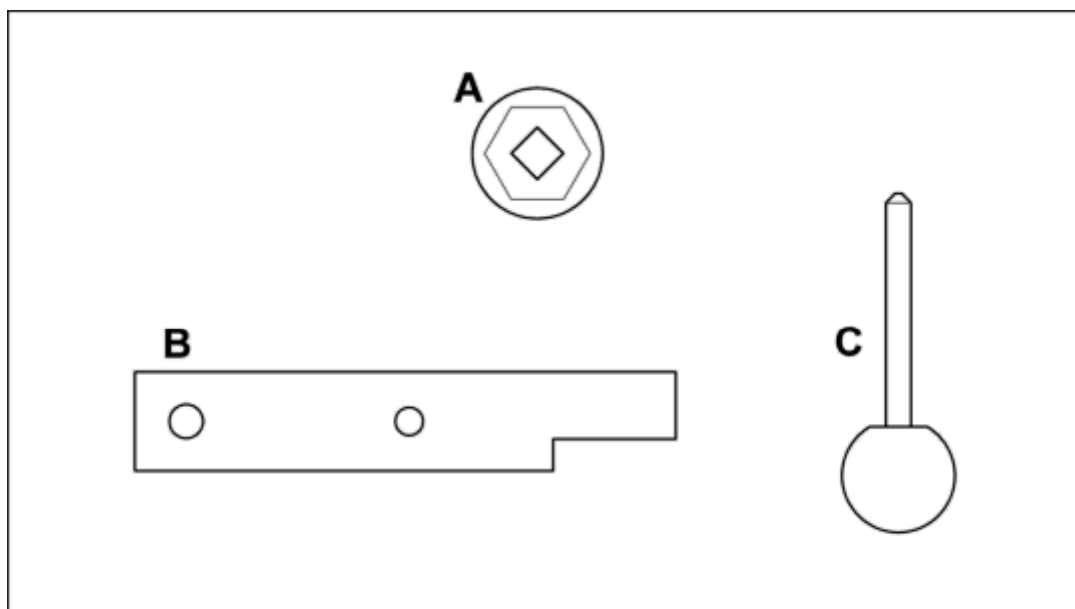
*Cams of cylinder 1*



*View shows position of cams on cylinder 5*

## Tools and materials

### Special tools



Tools

Item	Designation	Source	Explanation
-A-	Socket 9714	→ "See Workshop Equipment Manual, Chapter 2.2.2 "	Very low height, turn towards engine
-B-	Camshaft guide 9678	→ "See Workshop Equipment Manual, Chapter 2.2.2 "	For adjusting the timing; guide is positioned in both rear grooves of the camshafts
-C-	Locating pin 9595/1	→ "See Workshop Equipment Manual, Chapter 2.2.2 "	For fixing the pulley. The piston of cylinder 1 is then at TDC; position locating pin correctly in groove provided in timing case.

## Adjusting the timings for the camshafts

### Adjusting the timings for camshafts

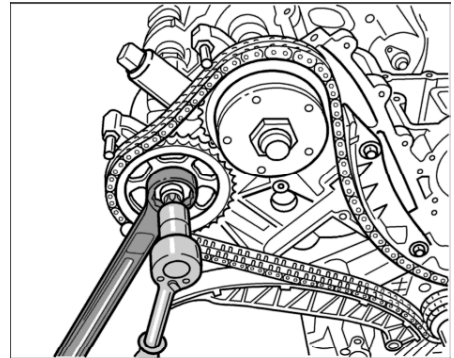
The crankshaft is positioned in the TDC and is fixed using **fixing pins 9595/1** once the above preliminary check has been performed.



#### Note

*The fastening screws on the sprocket wheels do not need to be replaced after they have been undone.*

- Undo all four fastening screws of the camshaft wheels (two camshaft adjusters) on both cylinder rows. For this purpose, hold the hexagon of the camshaft wheel on the respective camshaft with the ring wrench and release pan-head screw M12 1 by 2 revolutions  
**--To illustrate the process more clearly, the figure does not show the timing case lid--** .

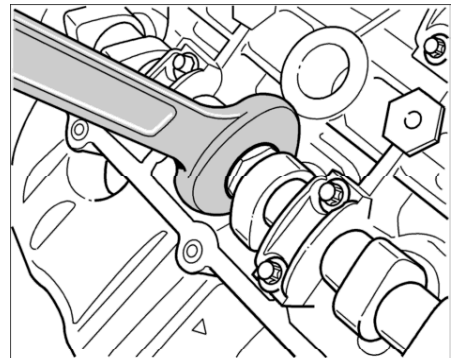


Fastening screws of the camshaft wheels



**Note**

- Cylinder rows 1 - 4 and 5 - 8 are adjusted at the same time without the camshaft being turned!
2. Turn the four camshafts on the hexagon with an open-ended wrench until the **camshaft guide 9678** can be pushed into the grooves of both camshafts of a cylinder row.



Hexagon on camshaft

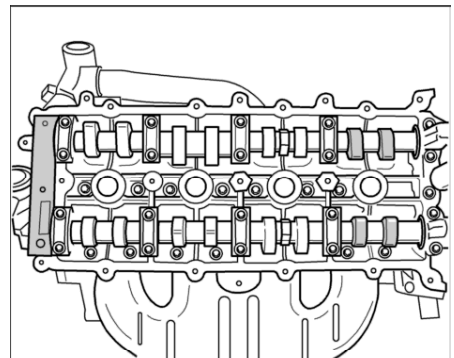
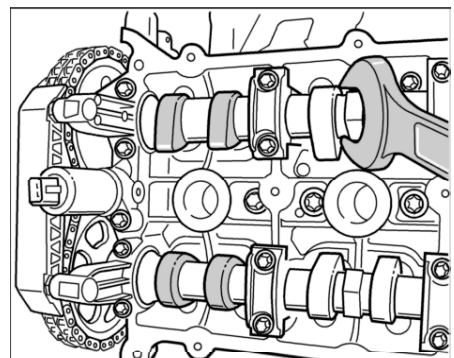


Figure shows the camshafts fixed with camshaft guide on a cylinder row.

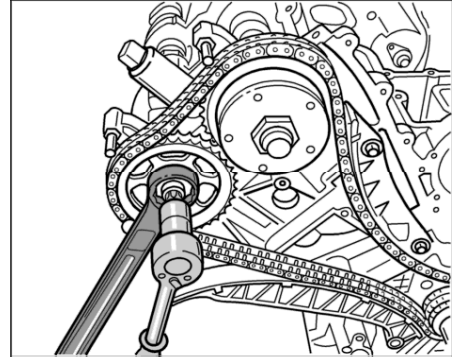


**Note**

- Cylinder rows 1 - 4 and 5 - 8 are adjusted at the same time without the camshaft being turned!
3. Then adjust camshafts of the other cylinder row. For this purpose, turn the hexagon with the open-ended wrench and fix it with **camshaft guide 9678**. Check whether the camshaft guide alternately fits into the grooves on both cylinder rows of the camshafts.



Correct positioning of cams in cylinder row 5 - 8



*Camshaft wheels with pan-head screw  
M12*

4. Tighten all camshaft wheels (two camshaft adjusters) again with pan-head screw M12. For this purpose, hold hexagon of the respective camshaft with ring wrench and tighten M12 pan-head screw. For tightening torques, see → 150719 Removing and installing camshaft wheel - Chapter "Reworking".
5. Remove **camshaft guide 9678** and **fixing pins 9595/1**.

## Subsequent work

### Reworking

1. Install camshaft housing cover on both cylinder rows → 159123 Installing camshaft housing cover - Chapter "Installing".

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9PAAE1, 9PAAE7, 9PAAF1, 9PAAJ1

as of MY 2003

Country C00, C02, C05, C07, C08, C09, C10, C11, C12, C13, C14, C15, C16, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C32, C33, C34, C35, C36, C37, C38, C39, C45, C46, C98, C99