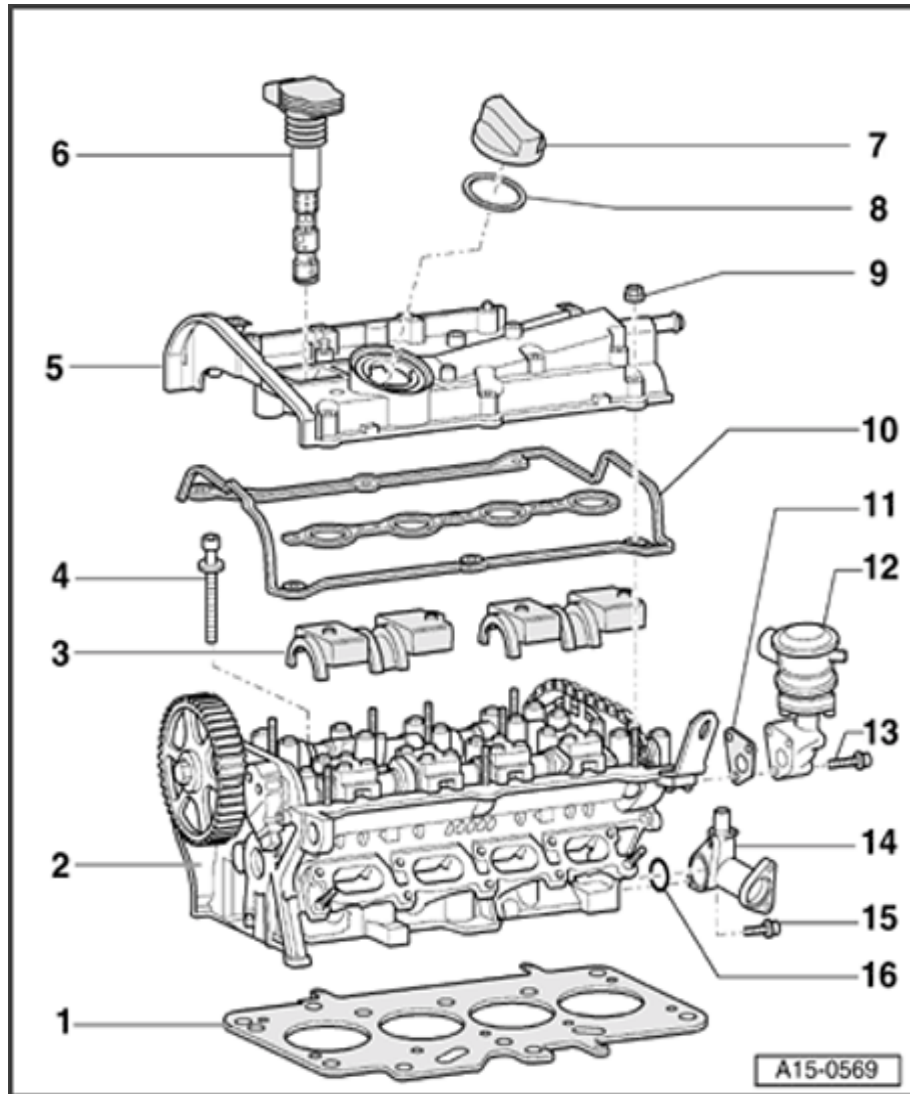


Cylinder head, removing and installing

Note:

- ◆ *Always replace the cylinder head bolts.*
- ◆ *When performing repairs, replace seals, gaskets, self-locking nuts and bolts which have a specified tightening angle.*
- ◆ *The hose connectors and hoses of charge air system must be free of oil and grease before assembling.*
- ◆ *When installing an exchange cylinder head with the camshafts installed, the contact surfaces between bucket tappet and cam running surface must be oiled after installation of the cylinder head.*
- ◆ *The plastic protectors fitted to protect the open valves must only be removed immediately before installing the cylinder head.*
- ◆ *When installing a new cylinder head or cylinder head gasket, drain off all the old coolant and re-fill with new coolant.*

- ◆ *Cylinder heads which have cracks between the valve seats or between valve seat inserts and the spark plug thread can be used further without reducing service life, provided the cracks do not exceed a maximum of 0.3 mm in width, or when no more than the first 4 turns of the spark plug threads are cracked.*



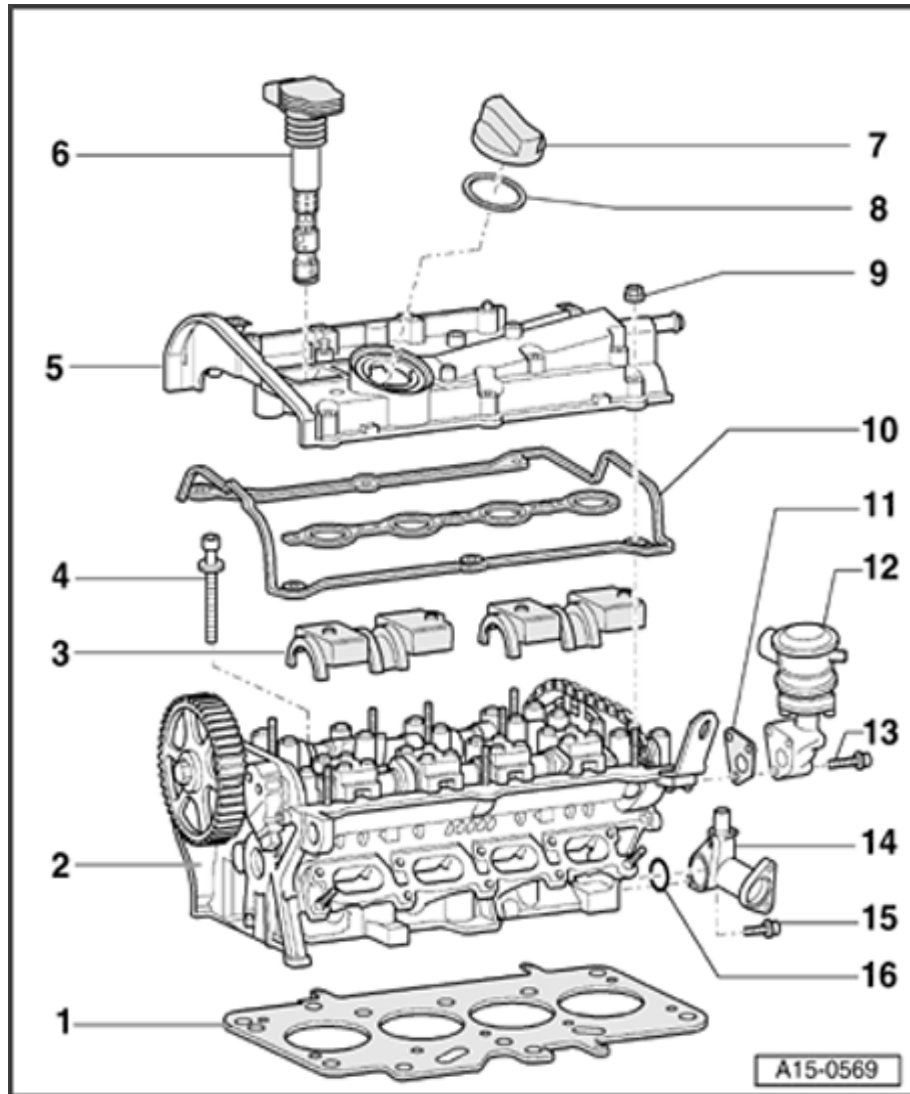
Part I - Cylinder head components

1 - Cylinder head gasket

- ◆ Replacing ⇒ Removing cylinder head, ⇒ [Page 15-20](#)
- ◆ Installation position: Part No. to cylinder head
- ◆ After replacing, fill with fresh coolant

2 - Cylinder head

- ◆ Removing ⇒ [Page 15-20](#)
- ◆ Check for distortion ⇒ Fig. ⇒ [1](#) , ⇒ [Page 15-7](#)
- ◆ Reworking dimension ⇒ Fig. ⇒ [2](#) , ⇒ [Page 15-7](#)
- ◆ Installing ⇒ [Page 15-28](#) .
- ◆ After replacing, fill with fresh coolant



3 - Oil deflector

- ◆ Note installation position

4 - Cylinder head bolt

- ◆ Always replace
- ◆ Note sequence when loosening ⇒ [Page 15-27](#)
- ◆ Note sequence when tightening ⇒ [Page 15-30](#)

5 - Cylinder head cover

- ◆ Removing and installing ⇒ [Page 15-15](#)

6 - Ignition coil

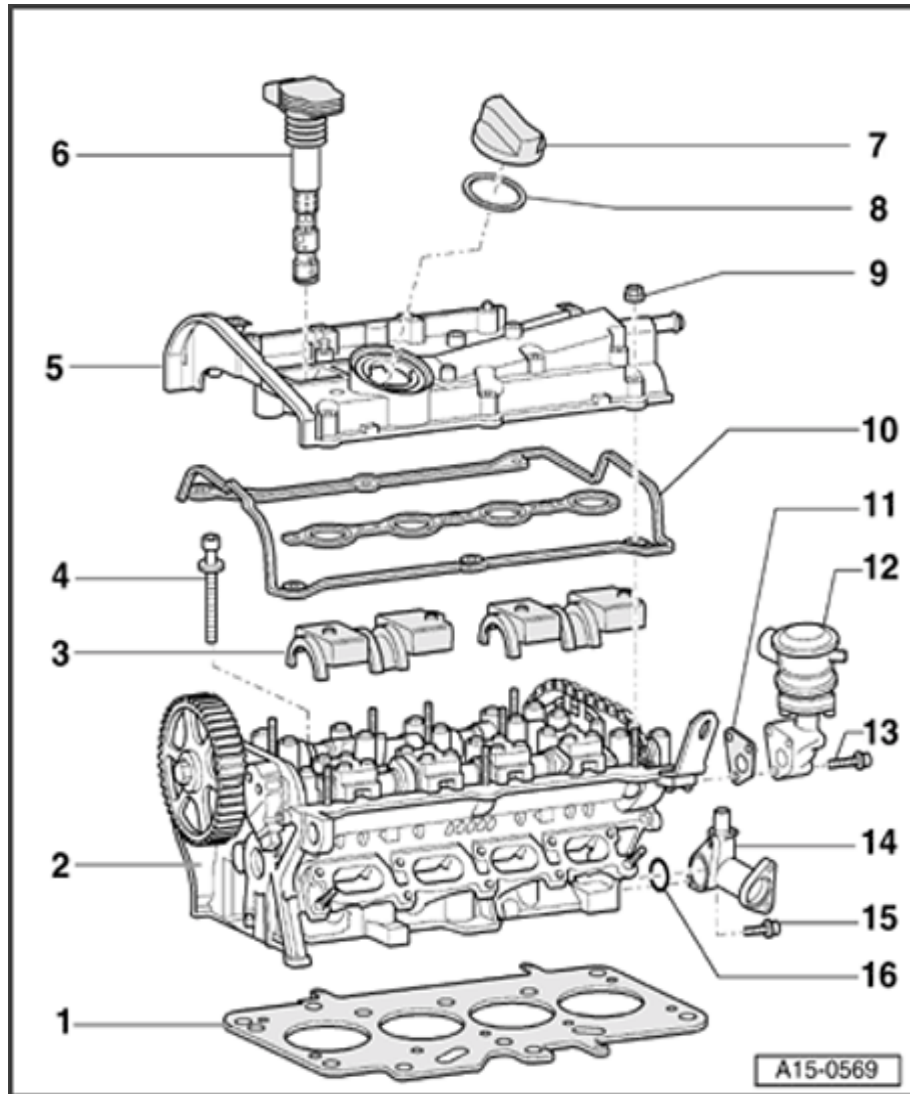
7 - Cap

8 - Gasket

- ◆ Replace if damaged or leaking

9 - 10 Nm

- ◆ First tighten inner nuts
- ◆ Tighten outer nuts diagonally



10 - Cylinder head cover gasket

- ◆ Replace if damaged or leaking
- ◆ Before installing gasket apply "AMV 174 004 01" to sealing points ⇒ Fig. ⇒ [3](#) and Fig. ⇒ [4](#) , ⇒ [Page 15-8](#)

11 - Gasket

- ◆ Always replace

12 - Combi valve for secondary air inlet

- ◆ With screw connection

13 - 10 Nm

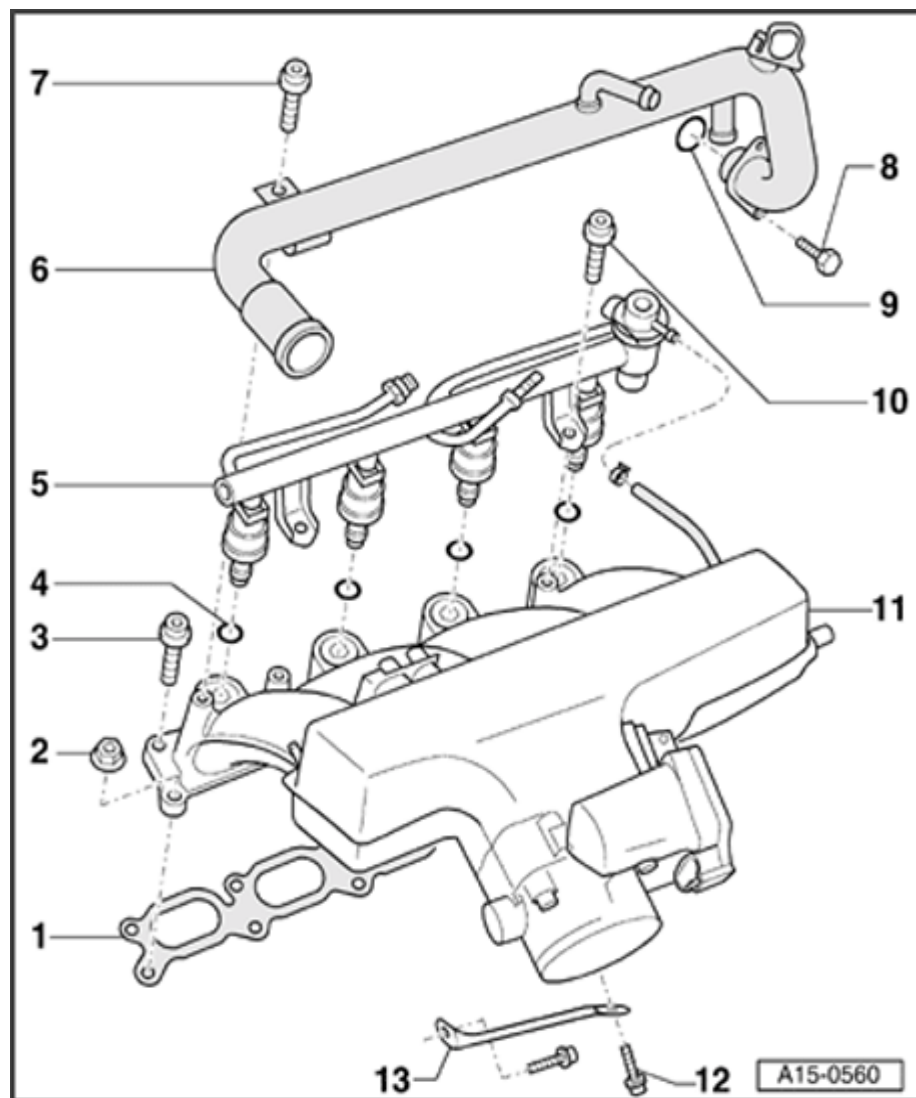
14 - Coolant flange

- ◆ With coolant temperature sensor

15 - 10 Nm

16 - O-ring

- ◆ Always replace



Part II - Intake manifold components

1 - Gasket

- ◆ Note installation position
- ◆ Always replace

2 - 10 Nm

3 - 10 Nm

4 - O-ring

- ◆ For injector
- ◆ Always replace

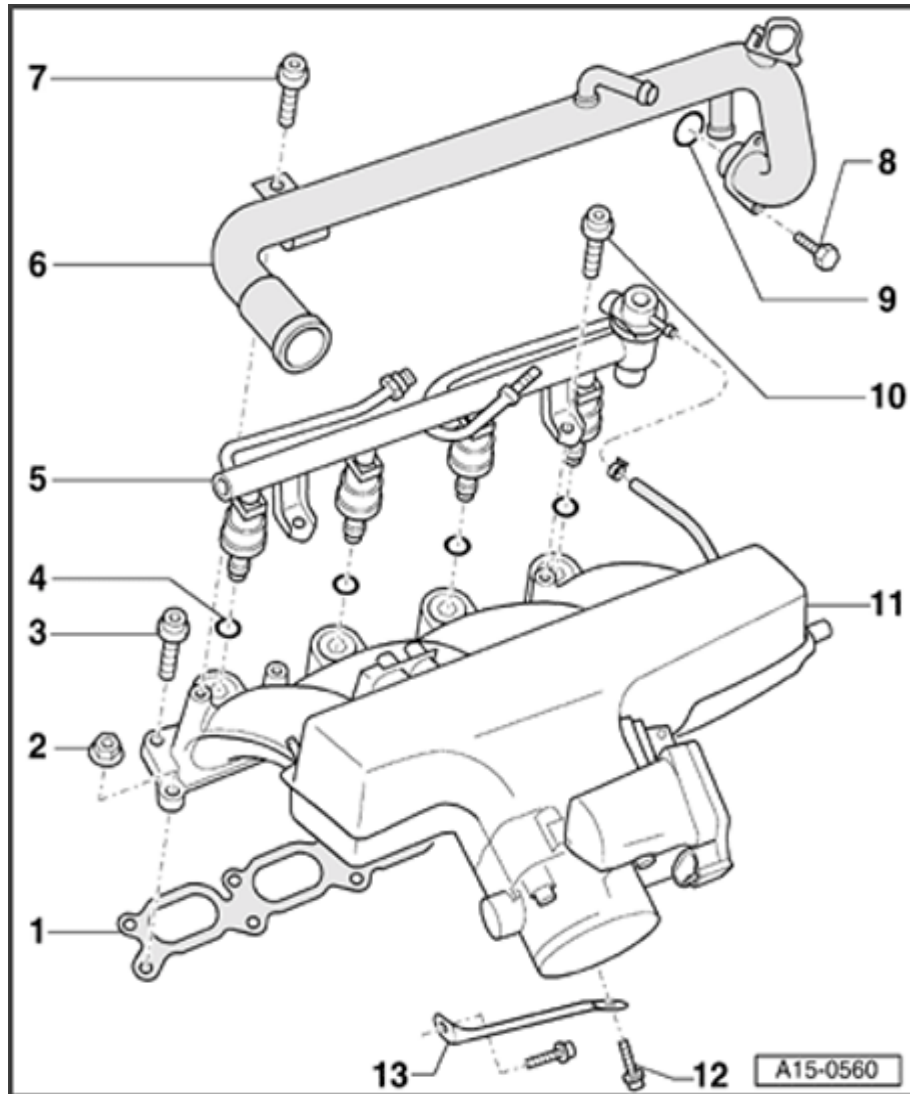
5 - Fuel rail

- ◆ With injectors

6 - Top coolant line

7 - 10 Nm

8 - 10 Nm

**9 - O-ring**

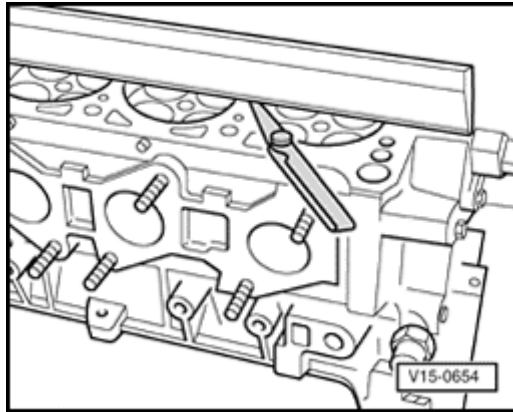
- ◆ For top coolant line
- ◆ Always replace

10 - 10 Nm**11 - Intake manifold**

- ◆ Removing and installing ⇒ [Page 15-9](#)

12 - 20 Nm**13 - Support**

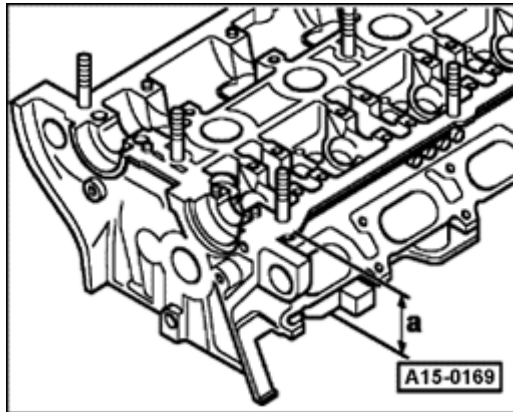
- ◆ For intake manifold



A

Fig. 1 Check cylinder head for distortion.

- Use knife edge, straightedge and feeler gauge to measure at several points.
- Max. permissible distortion: 0.1 mm

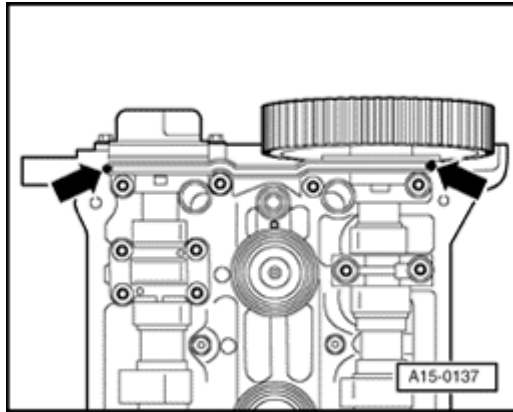


A

Fig. 2 Reworking dimension for cylinder head

Reworking the cylinder head (shaving) is only permitted down to minimum dimension -a-.

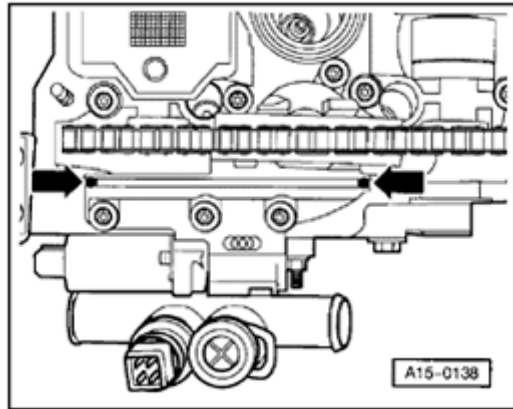
- ◆ Minimum dimension -a- = 139.20 mm



A

Fig. 3 Seal connections between double bearing cap and cylinder head

- Apply a small quantity of sealant AMV 174 004 01 to sides of joints - arrows- on upper sealing surface of cylinder head.



A

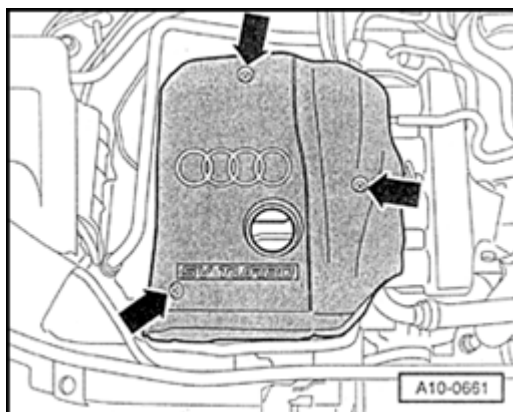
Fig. 4 Seal connections between camshaft adjuster and cylinder head

- Apply a small quantity of sealant AMV 174 004 01 to sides of joints - arrows- on upper sealing surface of cylinder head.

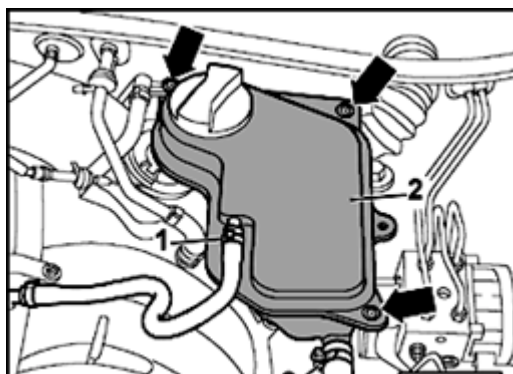
Intake manifold, removing and installing

Removing

- Observe or obtain radio anti-theft code on vehicles with coded radio.
- Disconnect Ground strap at battery with ignition switched off.

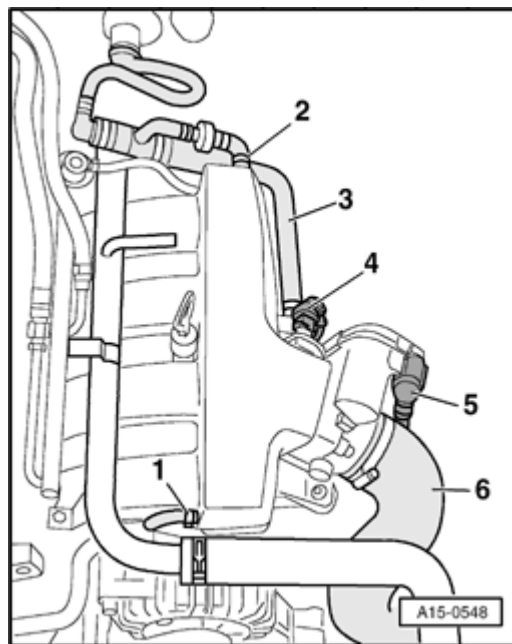


- A - Remove engine cover -arrows-.
- Drain coolant ⇒ [Page 19-4](#) .

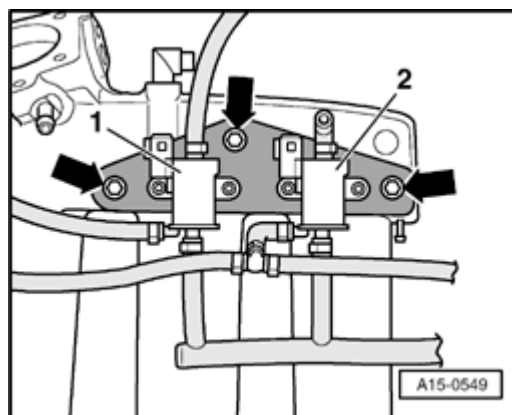


- A - Disconnect coolant hoses -1- and -3-.
- Unbolt coolant expansion tank -2- (-arrows-).
- Disconnect electrical wiring to coolant level display switch -F66- on bottom of expansion tank.

15-10



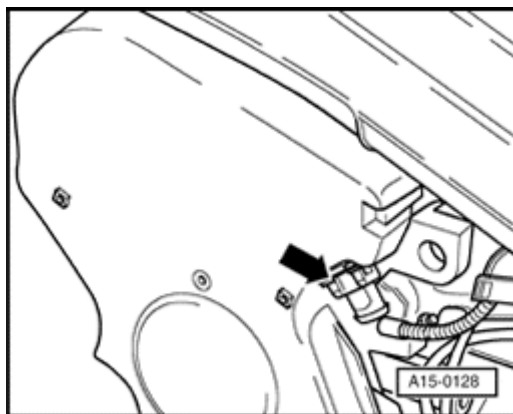
- A**
- Unplug vacuum hoses -1 to 3-.
 - Disconnect connectors as follows:
 - 4 - on intake air temperature sensor -G42-
 - 5 - for throttle valve control module -J338-
 - Remove the air duct hose -6- from throttle valve control module.



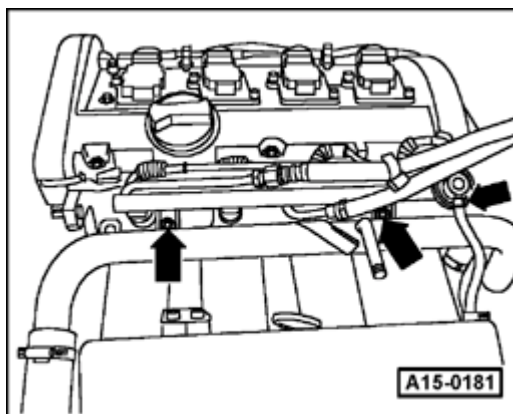
- A**
- Remove retaining plate for recirculation valve for turbocharger -N249- - 1- from underneath intake line and secondary air inlet valve -N112 -2- - arrows-.

Note:

The electrical connectors and vacuum hoses do not have to be disconnected.



- A** - Disconnect connector for Camshaft Position sensor -arrow-.

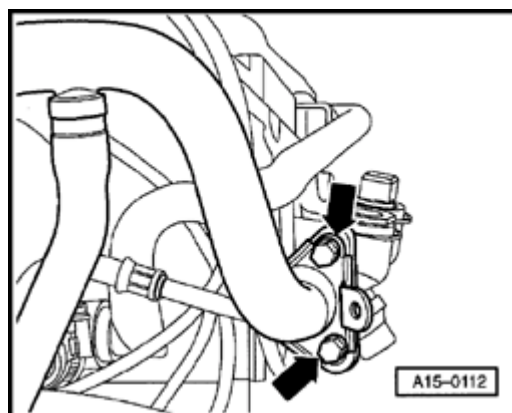


- A** - Remove retaining bolts for fuel manifold and disconnect vacuum line from fuel pressure regulator -arrows-.
- Remove fuel manifold together with injectors from intake manifold and place it on a clean cloth at back of engine compartment.

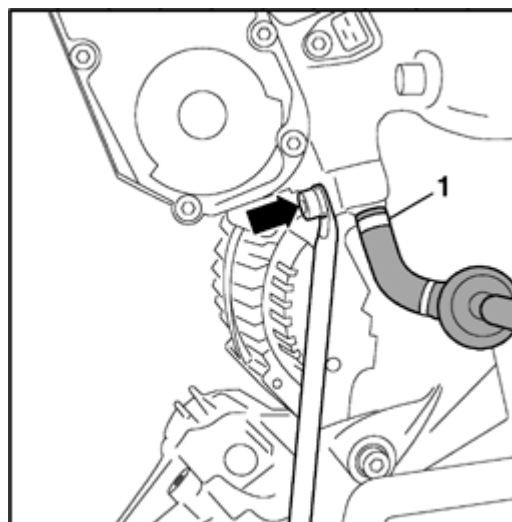
Note:

Carefully protect the removed injectors from contamination.

- Disconnect coolant hoses from upper coolant line.
- Move electrical wiring at top of coolant line aside.



- A
- Unbolt upper coolant line from intake manifold and coolant flange - arrows- at back of cylinder head.



- A
- Remove intake line support -arrows-.
 - Disconnect hose -1- to ACF valve on intake line.
 - Pull out oil dipstick.
 - Remove bracket of guide line for oil dipstick.

- Remove suction hose from flange and remove.

Note:

Plug intake ports on cylinder head with clean cloths.

Installing

Installation is carried out in the reverse order of removal; note the following:

Note:

- ◆ *All cable ties which are released or cut open when removing must be located in the same position when installing.*
- ◆ *Hose connections and hoses of charge air system must be free of oil and grease before assembling.*
- ◆ *Replace seals and gaskets.*
- Top up coolant ⇒ [Page 19-7](#) .
- After connecting battery, enter anti-theft code for radio.

⇒ *Radio operating instructions*

- Close windows fully using window switches.

- Actuate all power window switches again for at least one second in the "close" direction to activate automatic open/close function.
- Set clock to correct time.
- Perform throttle-valve control module adaption:

⇒ [Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Engine Code\(s\): AWM, Repair Group 24](#)

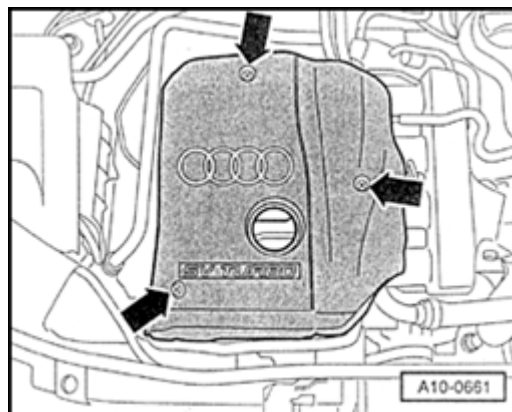
Tightening torques

Component	Nm
Intake manifold to cylinder head	10
Support for intake manifold	to intake manifold 20
	to bracket 20
Fuel manifold to intake manifold	10
Coolant line to coolant flange	10
Coolant line on intake line	10
Hose clamps for coolant hoses	

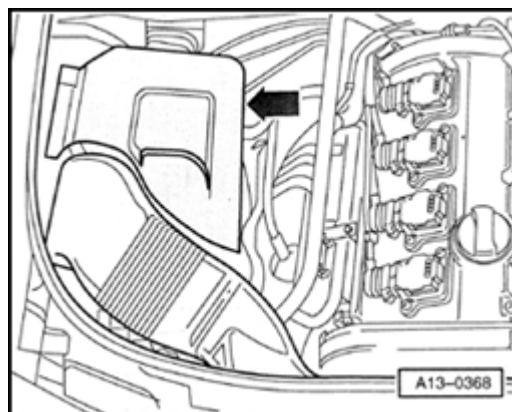
	2
Hose clamps for air duct hoses	3.5

Cylinder head cover, removing and installing

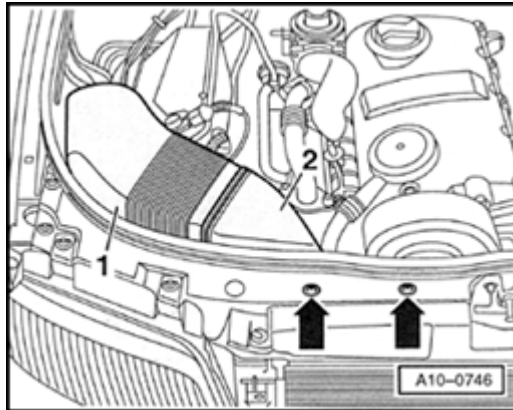
Removing



- Remove engine cover -arrows-.

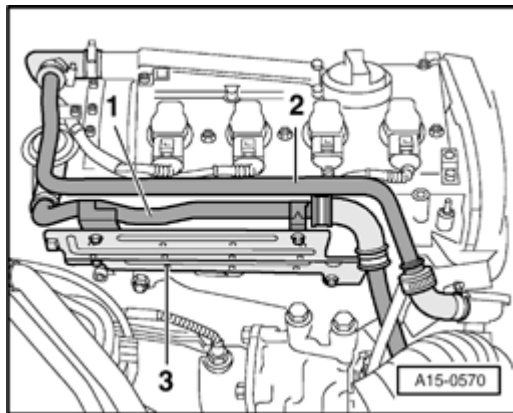


- Remove air filter cover -arrow-.



A

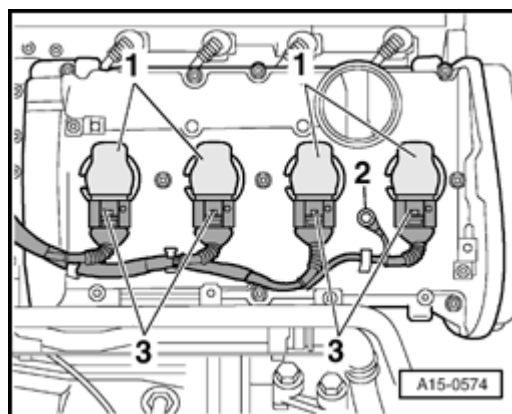
- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.



A

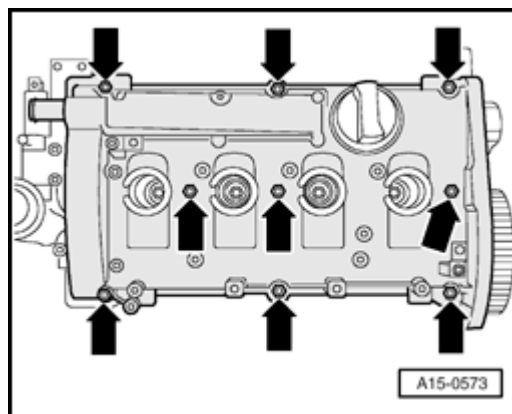
- Remove line of crankcase vent -1-.
- Disconnect hose of crankcase venting from cylinder head cover.
- Remove line -1- from combination valve for secondary air inlet on cylinder head cover and from heat shield -3- (engine code ANB only).
- Slightly swivel secondary air inlet line to side.

15-17



A

- Disconnect Ground wire -2-.
- Disconnect connectors -3-.
- Move lines and hoses aside.
- Remove ignition coils -1-.
- Loosen 2 top retaining clamps for toothed belt guard.



A

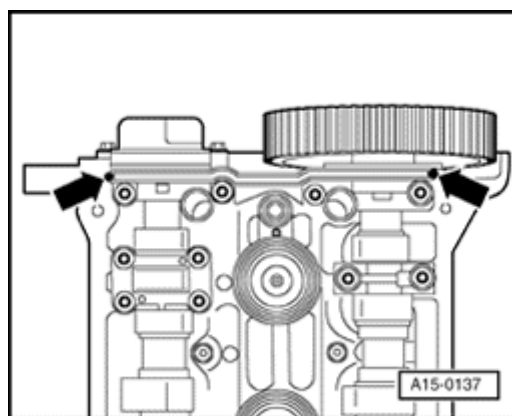
- Loosen nuts -arrows- for cylinder head cover and remove cylinder head cover.

Installing

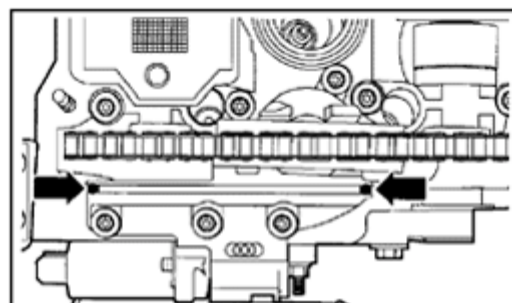
Installation is carried out in the reverse order of removal; note the following:

Note:

- ◆ *Replace seals and gaskets.*
- ◆ *Replace cylinder head cover gaskets if damaged.*

**A**

- Apply a small quantity of sealant AMV 174 004 01 to sides of joints - arrows- on upper sealing surface of cylinder head.

**A**

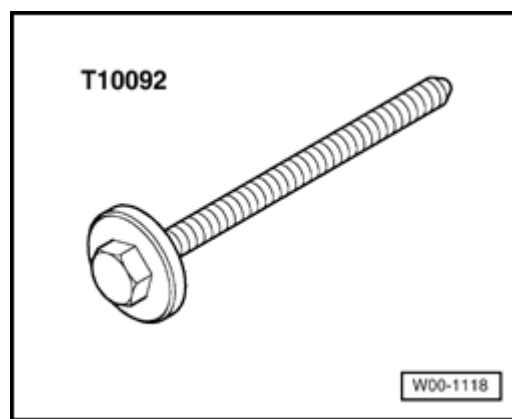
- Apply a small quantity of sealant AMV 174 004 01 to sides of joints - arrows- on upper sealing surface of cylinder head.
- First tighten inner nuts for cylinder head cover then tighten outer nuts diagonally.
- Check that upper toothed belt guard is correctly seated.

Tightening torques

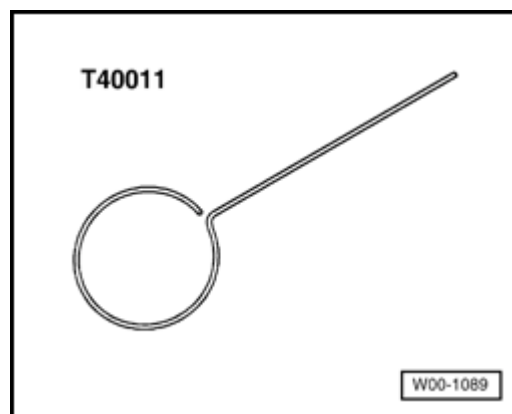
Component	Nm
Cylinder head cover to cylinder head	10
Line of crankcase vent to cylinder headcover	10
Line of secondary air inlet to cylinder head cover	10
Hose clamps	2

Cylinder head, removing

Special tools and equipment



- ◆ Socket head fastener T10092



- ◆ Pin T40011

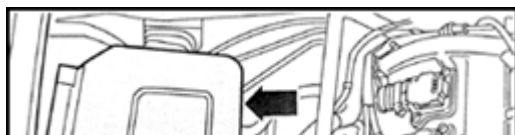
Procedure

- Engine in vehicle
- Lock carrier must be in service position ⇒ [Page 13-1](#) .

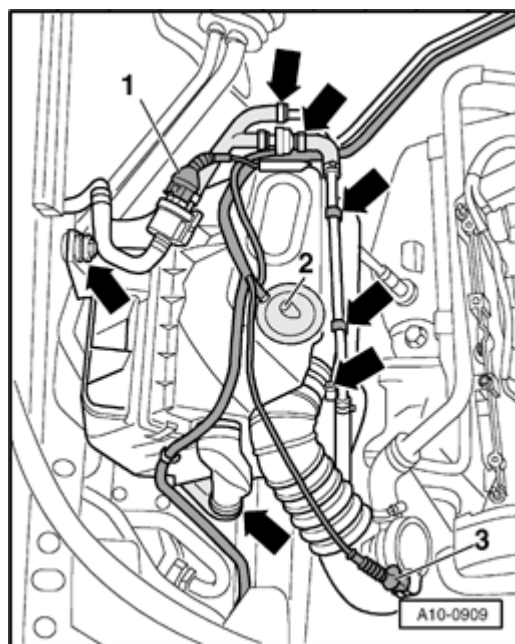
Note:

All cable ties which are released or cut open when removing must be located in the same position when installing.

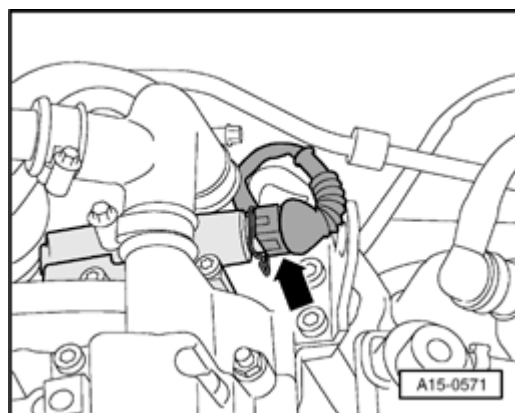
- Observe or obtain radio anti-theft code on vehicles with coded radio.
- Disconnect Ground strap at battery with ignition switched off.
- Drain coolant ⇒ [Page 19-4](#) .
- Remove intake line ⇒ [Page 15-9](#) .
- Remove ribbed belt and tensioner for ribbed belt ⇒ [Page 13-18](#) .
- Remove air filter cover -arrow-.



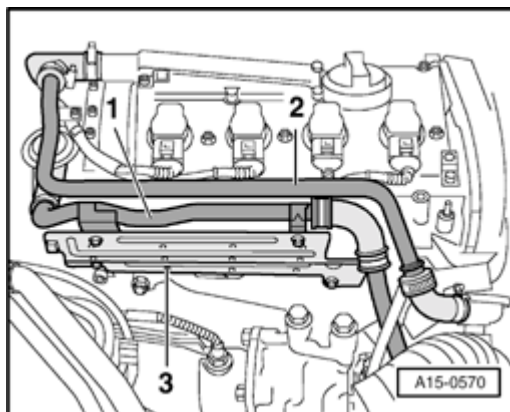
15-22



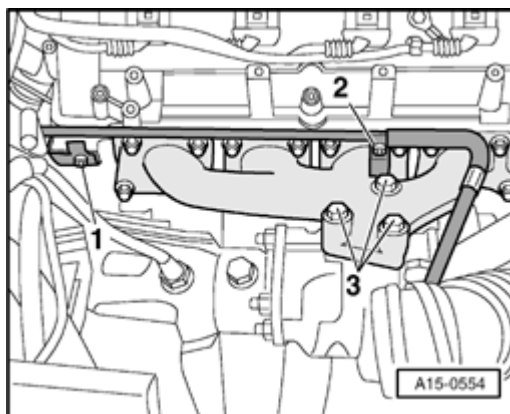
- A
- Disconnect connectors as follows:
 - 1 - on ACF valve (in addition, remove ACF valve from air filter housing)
 - 2 - on air mass meter
 - 3 - on solenoid valve for charge pressure control -N75-
 - Disconnect hose connections, move wiring aside and remove air filter housing -arrows-.



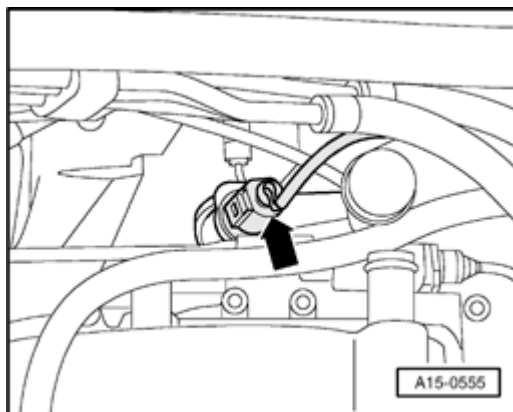
- A
- Disconnect connector -arrow- from camshaft adjuster.

**A**

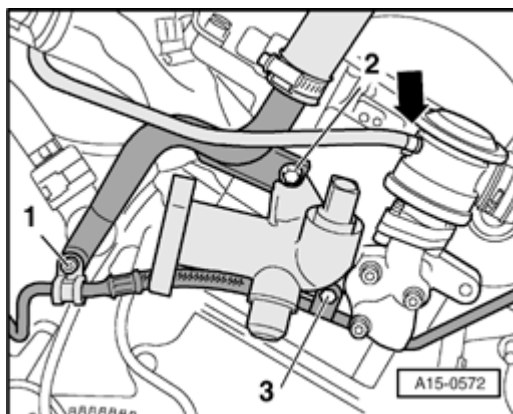
- Remove line of crankcase vent -1-.
- Remove hose of crankcase venting from cylinder head cover.
- Remove line -1- from combination valve for secondary air inlet on cylinder head cover and from heat shield -3- (engine code ANB only).
- Slightly swivel secondary air inlet line to side.
- Remove heat shield.

**A**

- Remove bolts -1- and -2- of oil feed line.
- Remove bolts -3- for exhaust turbocharger.

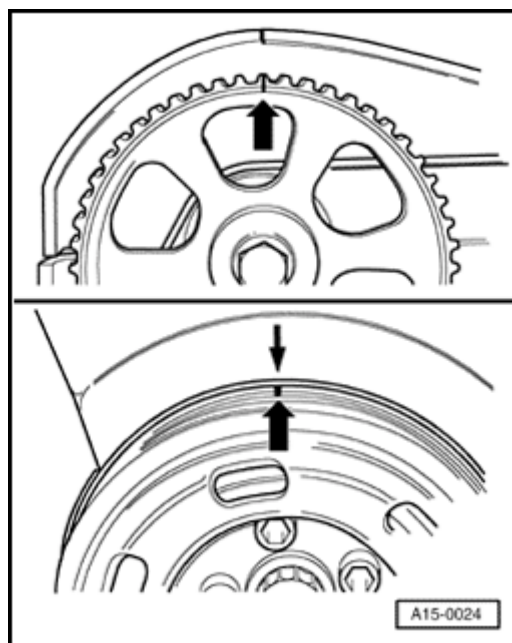


- A**
- Disconnect connector -arrow- at coolant temperature sensor -G2-/-G62-.



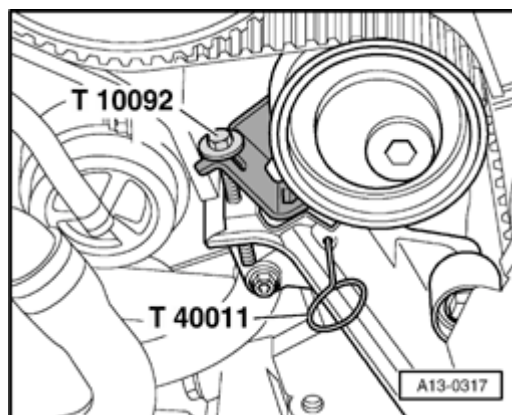
- A**
- Disconnect vacuum hose -arrow- from combination valve.
 - Remove bolts -2- and -3- and remove coolant flange.
 - Remove bracket -1- for oil feed line.
 - Unclip all wiring from cylinder head and move clear to one side.
 - Remove coolant hose going to heat exchanger (heater unit) at back of cylinder head (first release retainers on connecting flange).

- Remove upper toothed belt guard ⇒ [Page 13-35](#).



A

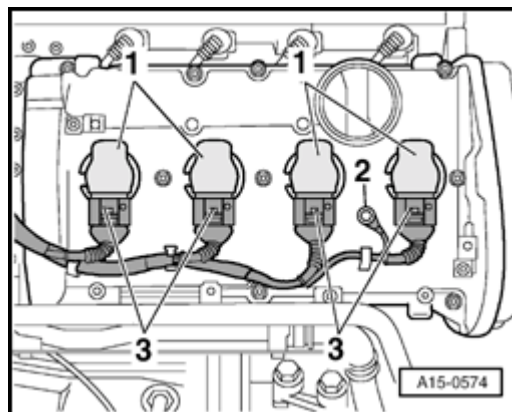
- Set crankshaft to markings for TDC of No. 1 cylinder by turning central bolt on crankshaft sprocket in direction of rotation -arrows-.



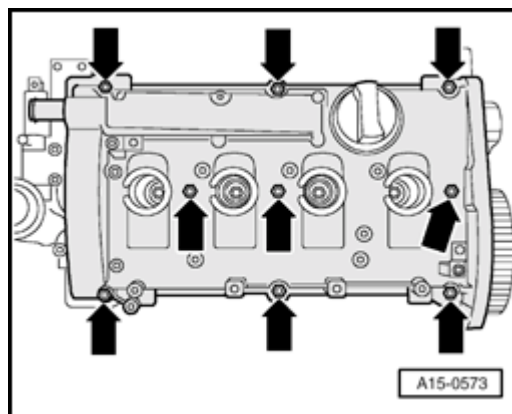
A

- Attach socket head fastener T10092 into tensioner.
- Only tension pressure piston of tensioner until piston is secured with pin T40011.
- Remove toothed belt from camshaft sprocket.

15-26

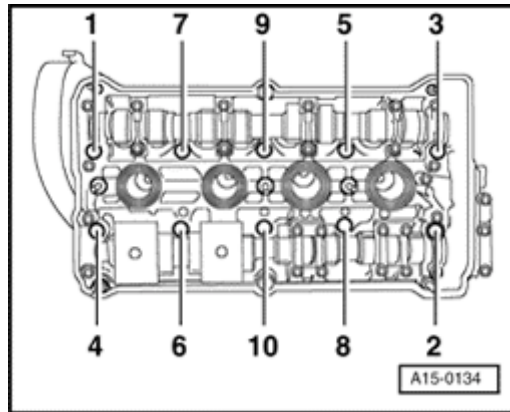


- A**
- Disconnect Ground wire -2-.
 - Disconnect connectors -3-.
 - Move lines and hoses aside.
 - Remove ignition coils -1-.



- A**
- Loosen nuts -arrows- for cylinder head cover and remove cylinder head cover.
 - Remove both oil deflectors.

15-27

**A**

- Loosen cylinder head bolts in correct sequence.
- Remove cylinder head.

Cylinder head, installing

Note:

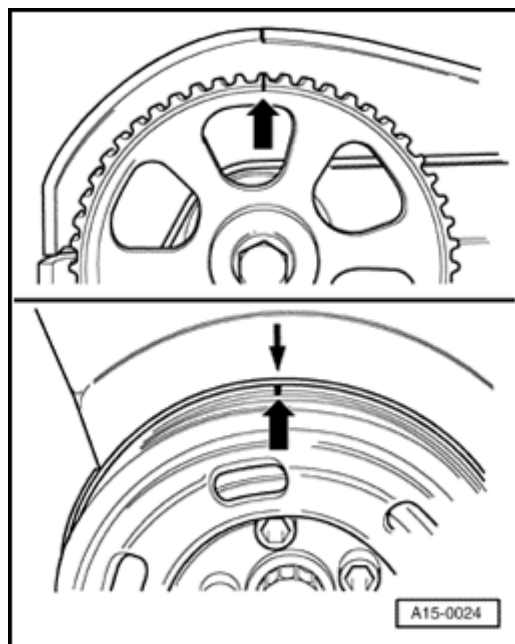
- ◆ *Always replace the cylinder head bolts.*
- ◆ *When performing repairs, replace seals, gaskets, self-locking nuts and bolts which have a specified tightening angle.*
- ◆ *Secure all hose connections with the correct hose clips (same as original equipment):*

⇒ *Parts List*

- ◆ *If repairing, carefully remove any remains of gasket material from the cylinder head and cylinder block. Make sure that no long scores or scratches are made on the surfaces.*
- ◆ *Carefully remove any remaining emery and abrasive material.*
- ◆ *Remove new cylinder head gasket from packaging, just before installation.*
- ◆ *Handle gasket extremely carefully. Damaging*

the silicone layer or the indented area will lead to leaks.

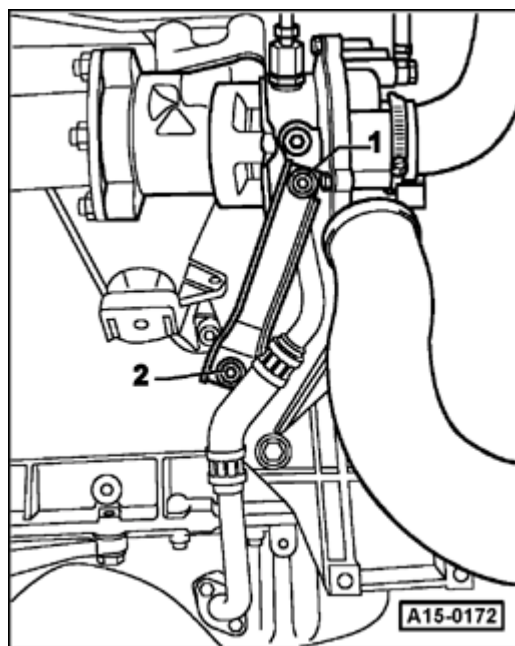
- ◆ *No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder head.*



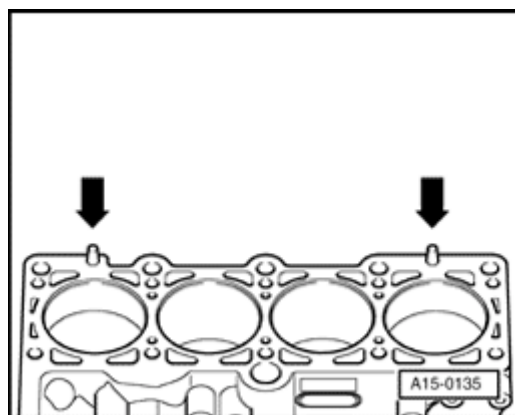
A

- Before positioning cylinder head, set crankshaft and camshaft to TDC of cylinder 1.

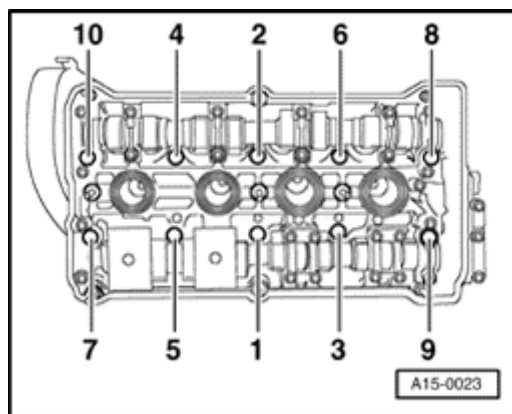
15-29



- A
- Loosen bolts -1- and -2- on turbocharger bracket (about 2 full turns each) to avoid stressing when installing cylinder head.



- A
- Place cylinder head gasket in position.
 - ◆ Note position of centralizing pins in cylinder block -arrows-.
 - ◆ Check installation position of cylinder head gasket. The Part No. should be legible from intake side.
 - Position cylinder head.



A

- Insert cylinder head bolts and tighten by hand.
- Tighten cylinder head bolts in two stages in sequence shown as follows:
- Tighten using torque wrench:
 - ◆ Stage 1: 40 Nm
- Tighten with rigid wrench:
 - ◆ Stage 2: 180° ($\frac{1}{2}$ turn) further (2 turns of 90° further is permissible)

Note:

It is not necessary to retighten cylinder head bolts after repairs have been performed.

- Tighten exhaust turbocharger to exhaust manifold with new seal and attach bracket to cylinder block ⇒ [Page 21-45](#) .
- Install cylinder head cover ⇒ [Page 15-18](#) .
- Install toothed belt (adjust valve timing) ⇒ [Page 13-44](#) .

Note:

Observe all instructions on removing and installing the toothed belt ⇒ [Page 13-40](#) .

- Install ribbed belt and tensioner for ribbed belt ⇒ [Page 13-20](#) .
- Install intake line ⇒ [Page 15-13](#) .
- Replace coolant ⇒ [Page 19-7](#) .
- After connecting battery, enter anti theft code for radio.

⇒ *Radio operating instructions*

- Close windows fully using window switches.
- Actuate all power window switches again for at least one second in the "close" direction to activate the automatic open/close function.
- Set clock to correct time.
- Perform throttle-valve control module adaption:

⇒ [Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel](#)

[Injection & Ignition, Engine Code\(s\): AWM,
Repair Group 24](#)

Tightening torques

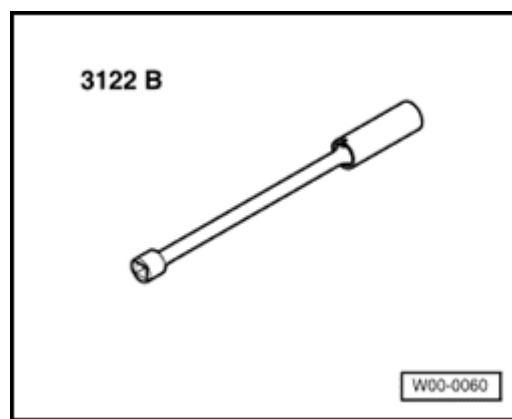
Component	Nm
Support for intake manifold to intake manifold	20
to bracket	20
Turbocharger to exhaust manifold	35 ¹⁾ 2)
Turbocharger bracket to cylinder block	25
Turbocharger bracket to turbocharger	30
Hose clamps for coolant hoses	2
Hose clamps for air duct hoses	3.5

1) Replace bolts

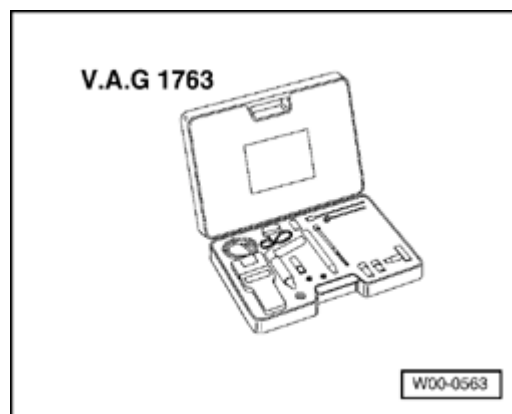
2) Coat thread and head attachment area with high temperature lubricant G 052 112 A3

Compression, checking

Special tools and equipment



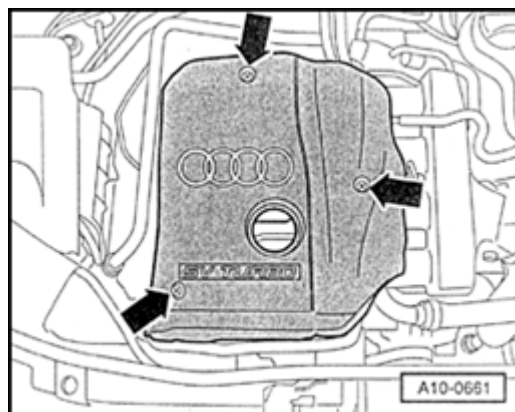
- ◆ Spark plug spanner 3122 B



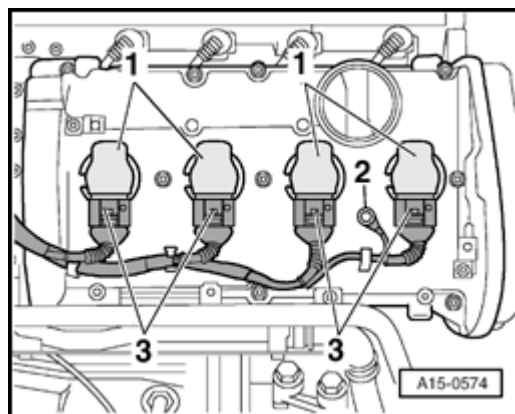
- ◆ Compression tester VAG VAG 1763

Test conditions:

- Engine oil temperature at least 30 ° C
- Battery voltage at least 12.7 V

Test sequence

- Remove engine cover -arrows-.
- Switch ignition off.



- Disconnect connectors -3-.
- Remove ignition coils -1-.

- Remove spark plugs with spark plug spanner 3122B.
- Disconnect connectors from all injectors.
- Fully open throttle valve.
- Check compression with compression tester VAG VAG 1763.

Note:

Using the compression tester

⇒ *Operating instructions*

- Operate starter until tester shows no further pressure increase.

Compression pressure values:

New	Wear limit	Permissible difference between cylinders

		bar excess pressure
bar excess pressure	bar excess pressure	
9.0 to 14.0	7.5	max. 3.0

- Install spark plugs and ignition coils.

Note:

Replace gaskets for ignition coils if damaged.

- Check Diagnostic Trouble Code (DTC) memory:

⇒ [Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Engine Code\(s\): AWM, Repair Group 01](#)

Note:

DTCs will have been recorded in the DTC memory because the connectors have been unplugged. Check and, if necessary, erase the DTC memory after completing the test.

Tightening torques

Component	Nm
Spark plugs in cylinder head	30