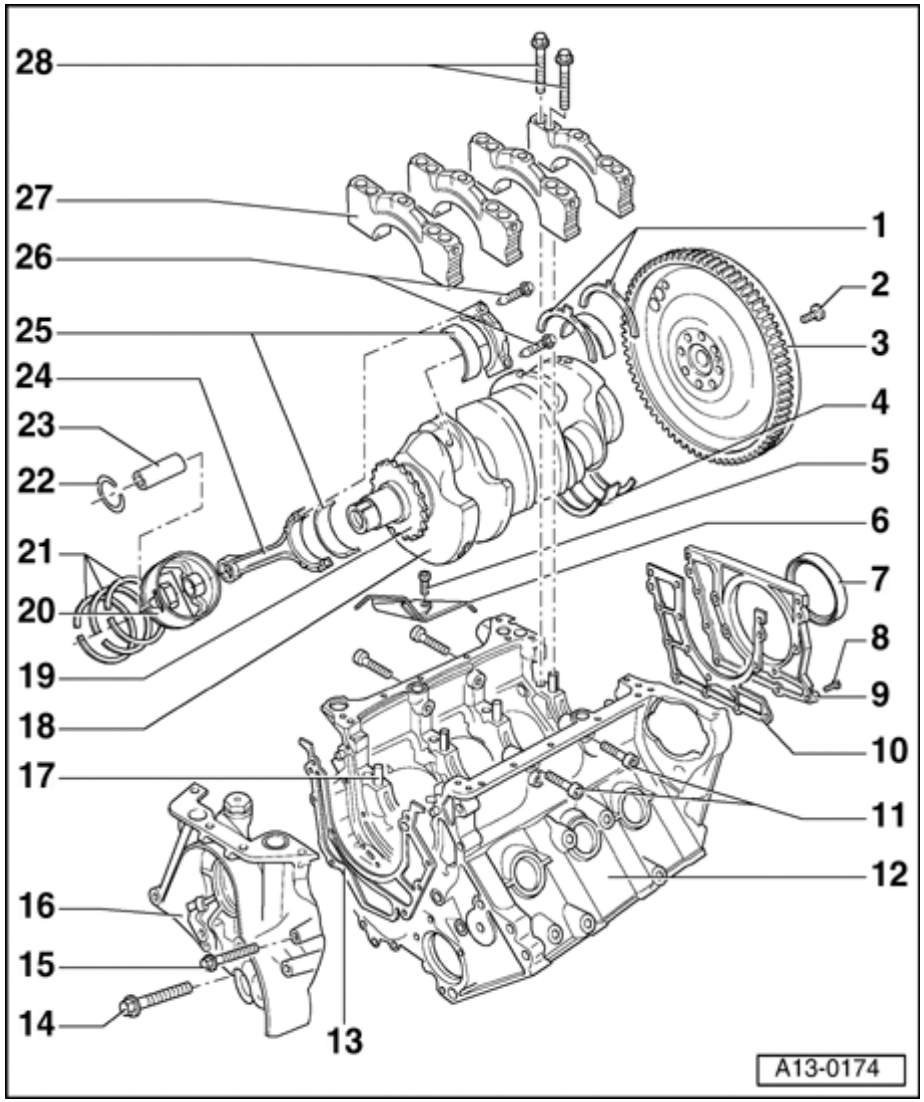
13-14



Cylinder block, crankshaft and flywheel, disassembly and assembly

Note:

Replace all gaskets and seals.

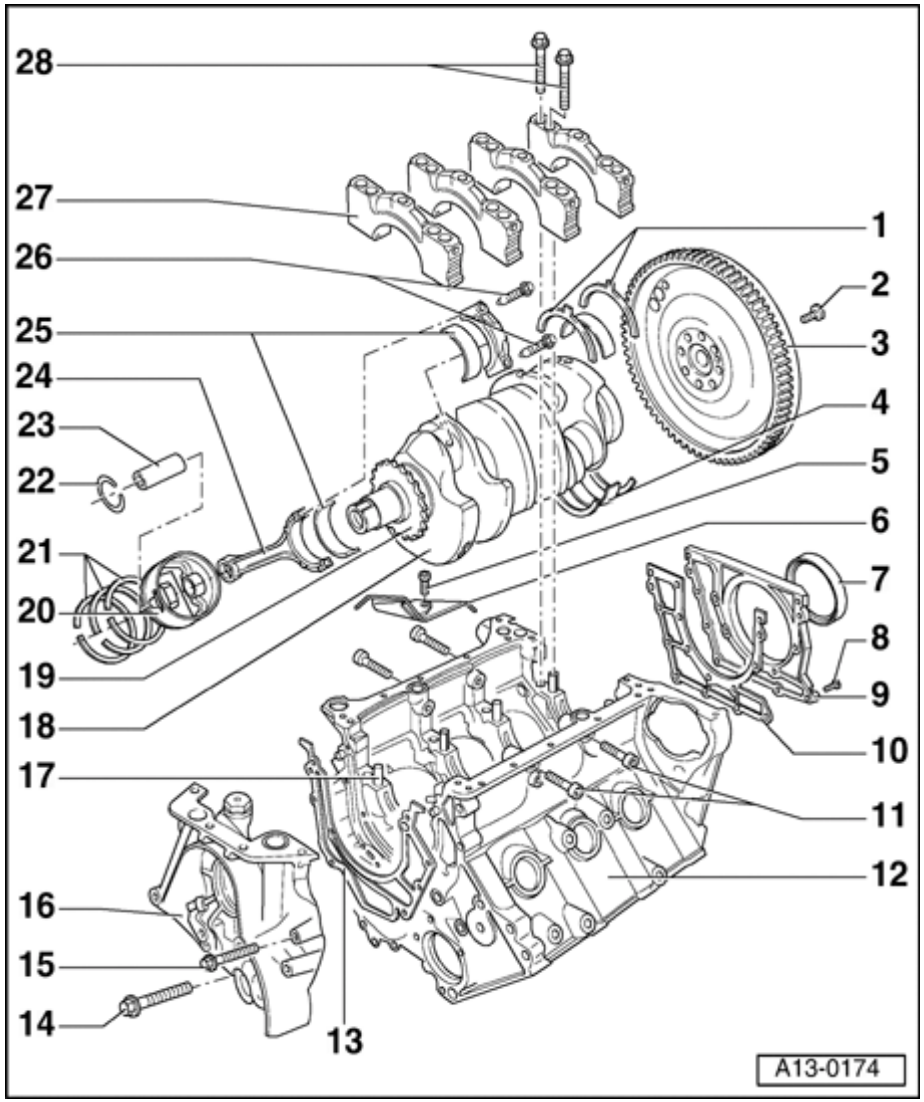
1 - Thrust washers

- Measuring axial clearance of crankshaft ⇒ Page 13-21
- Thrust washer only fitted on 4th crankshaft bearing

2 - Special bolt (double hex)

- Replace
- Dual-mass flywheel: 60 Nm + 180 ° (1/2 turn)

13-15



3 - Dual-mass flywheel

- Removing and installing ⇒ Page 13-29
- Removing and installing needle bearing ⇒ Page 13-35

4 - Crankshaft bearing

- Checking axial and radial clearance ⇒ Page 13-21

5 - Bolt, tightening torque 10 Nm

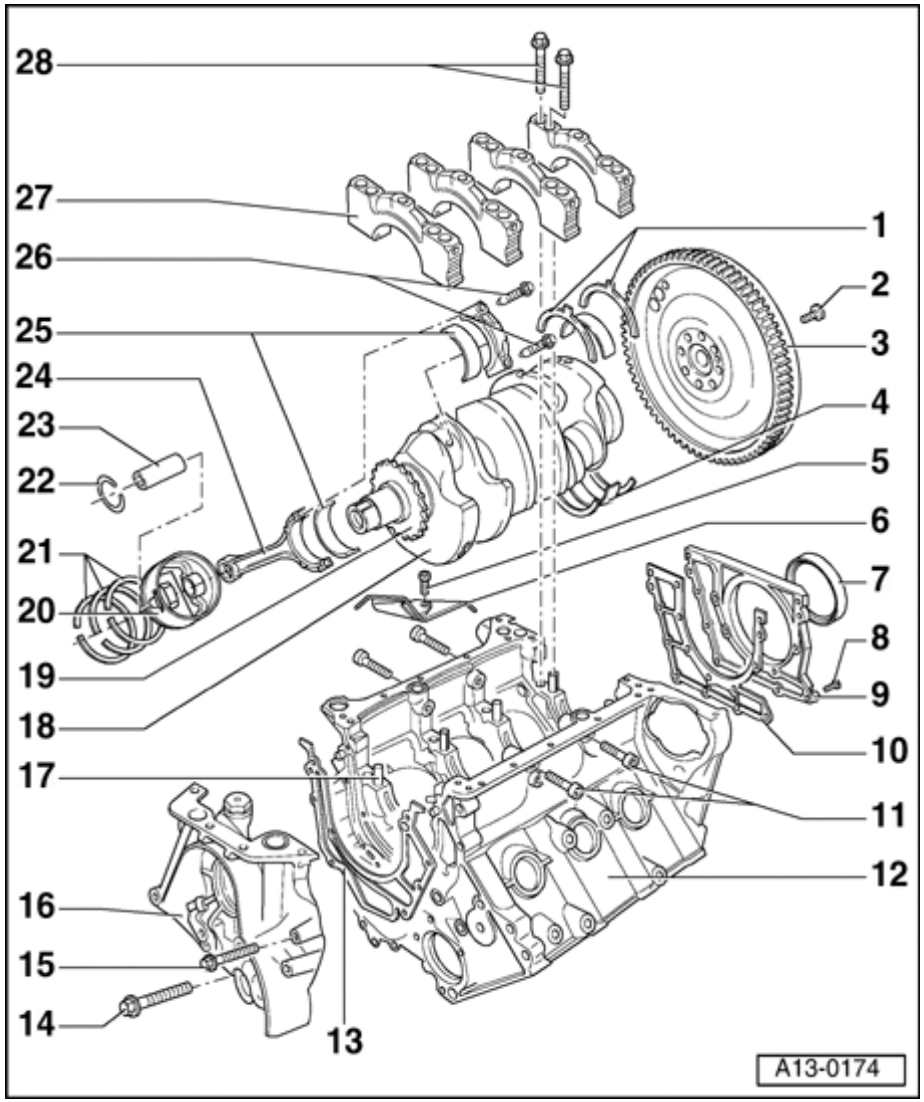
6 - Oil spray jet

- For piston cooling

7 - Oil seal for rear sealing flange

- Replacing ⇒ Page 13-23

13-16



8 - Bolt, tightening torque 10 Nm

9 - Rear sealing flange

10 - Gasket

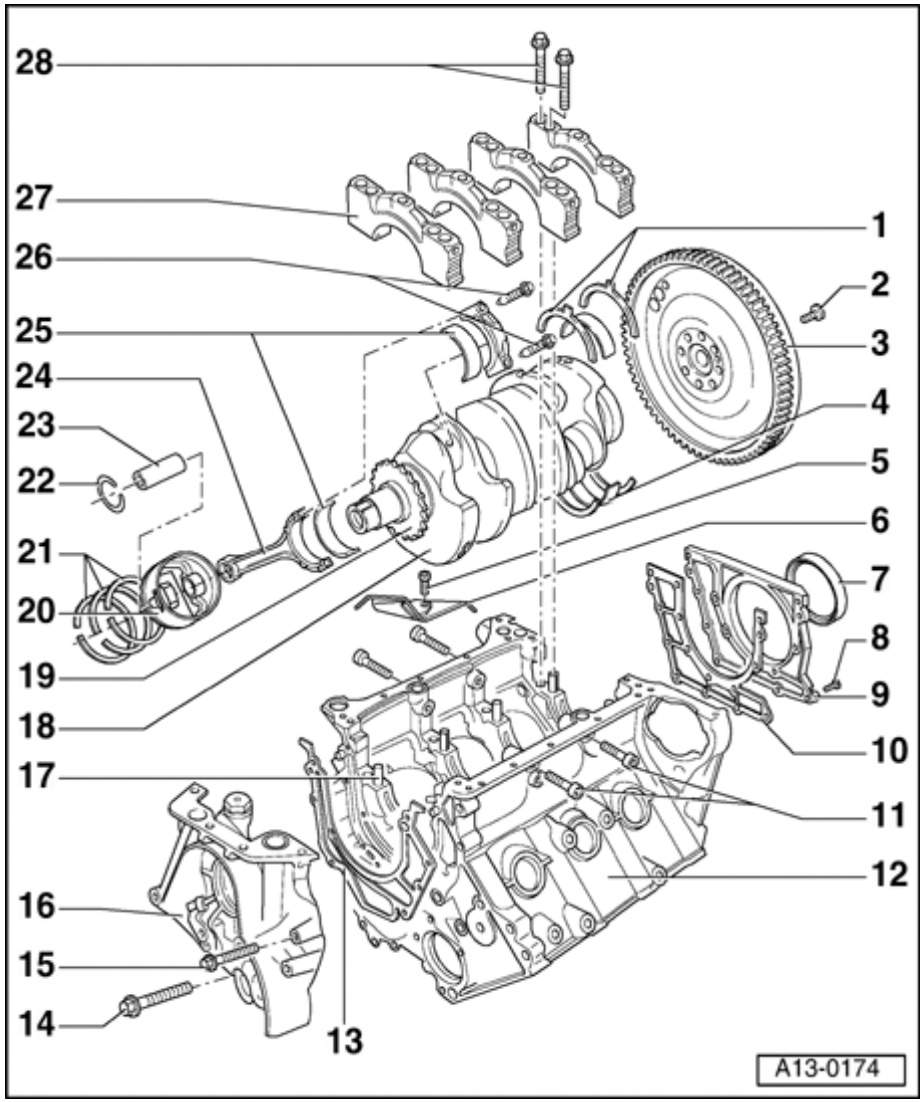
11 - Bolt, tightening torque 25 Nm

- Screw in bolts on left and right sides finger-tight before tightening bolts on main bearing caps.

12 - Cylinder block

13 - Gasket

13-17



14 - Collar bolt, tightening torque 30 Nm

- Apply Loctite ™ when installing

15 - Bolt, tightening torque 10 Nm

16 - Front sealing flange

17 - Expansion pins

18 - Crankshaft

- Checking ⇒ Page 13-21

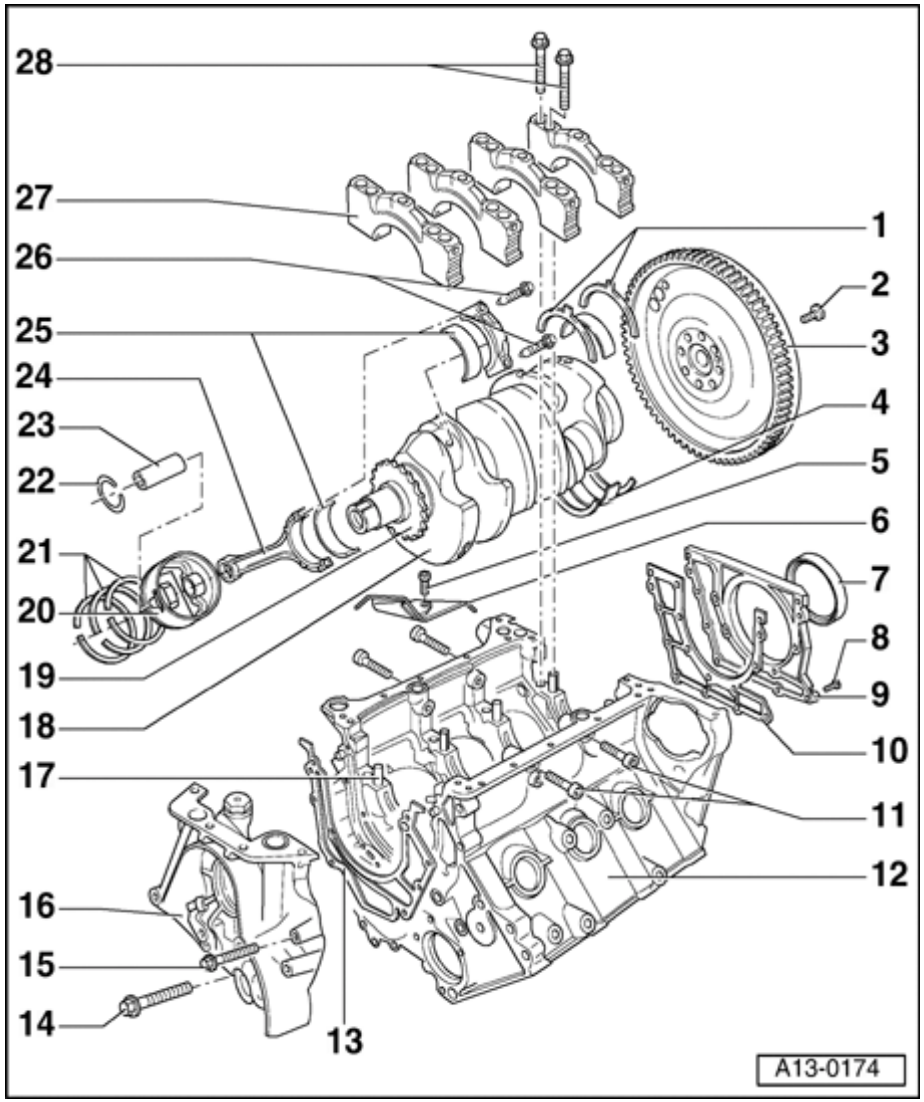
19 - Chain sprocket for oil pump

- Removing and installing ⇒ Page 17-62 .

20 - Pistons

- Checking ⇒ Page 13-36

13-18



21 - Piston rings

- Checking ⇒ Page 13-36

22 - Circlip for piston pin

23 - Piston pin

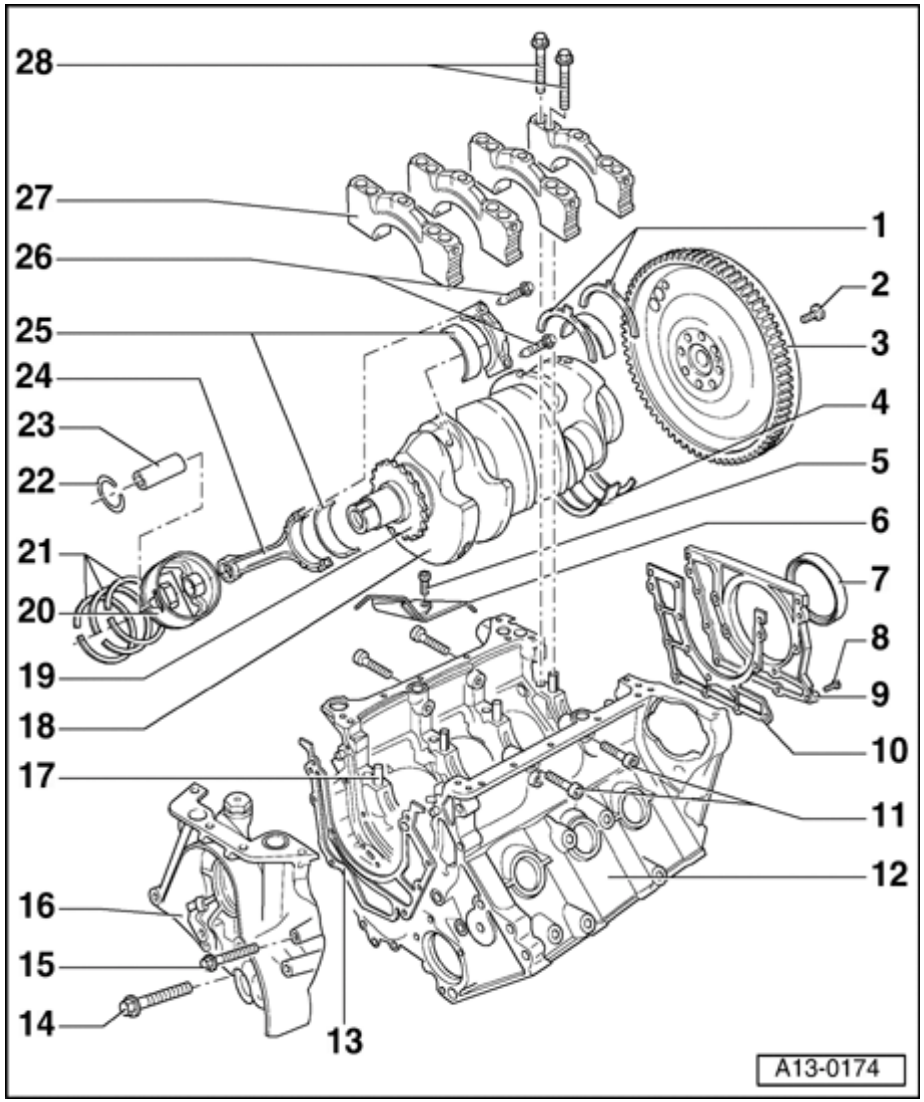
24 - Connecting rod

- Mark cylinder number and installation position of matching connecting rods and bearing caps before removing
- Installation position: wider, slightly convex machined surfaces on the same side

25 - Connecting rod bearing

- Do not interchange used bearing shells.
- Connecting rods, connecting rod bearings ⇒ Page 13-39

13-19



26 - Connecting rod bearing bolts

- Always replace
- Tightening torque: 30 Nm + 90° ($^1/_4$turn)
- When measuring radial clearance, tighten to 20 Nm but do not turn further.

27 - Main bearing cap

- Marking -1- on oil pump side
- Replace bolts for main bearing caps
- Watch position of dowel sleeves
- Checking bearing clearance ⇒ Page 13-21

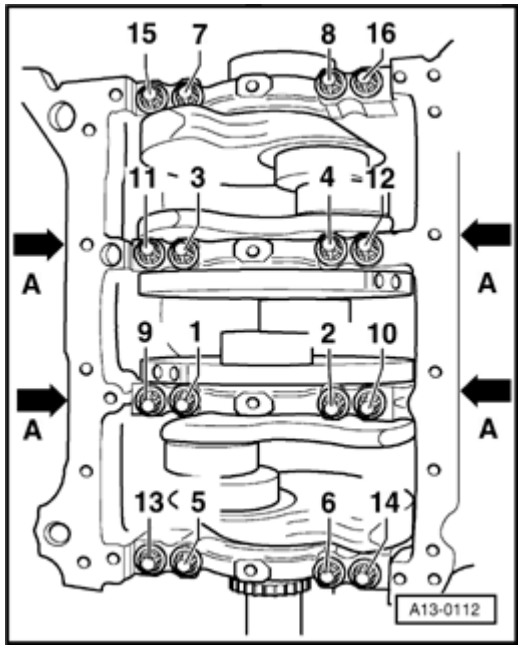
28 - Bolts for main bearing caps

- Always replace
- Tightening torque ⇒ Page 13-20
- Tightening sequence ⇒ Page 13-20

13-20

Crankshaft bearing caps, installing

- Bearing -1- is at the toothed belt end; bearing -4- is at the flywheel end.



Tightening sequence:

- Stage 1 Tighten all bolts in the sequence shown (1 - 16) to 30 Nm.
- Stage 2 Tighten all bolts in the sequence shown (1 - 16) to 60 Nm.
- Stage 3 Using a fixed wrench, turn all bolts in the sequence shown (1 - 16) 90° further.
- Tighten bolts -A- to 25 Nm.

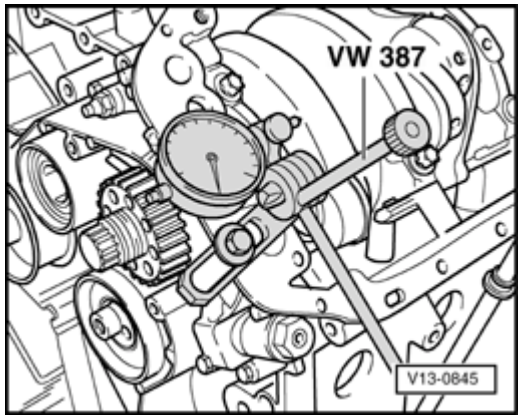
13-21

Crankshaft axial and radial clearance, measuring

Axial clearance

Note:

Do not interchange used bearings.



- Attach dial gauge with universal dial gauge bracket VW 387 to oil pump and bring it into contact with crank web.
- Press crankshaft against dial gauge by hand and set gauge to -0-.
- Press crankshaft away from dial gauge.
- Note reading:

Clearance when new	Wear limit
0.090 ... 0.251 mm	0.28 mm

Radial clearance

Measure radial clearance with Plastigage ™ .

- Read value:

Clearance when new	Wear limit
0.018 ... 0.045 mm	0.10 mm

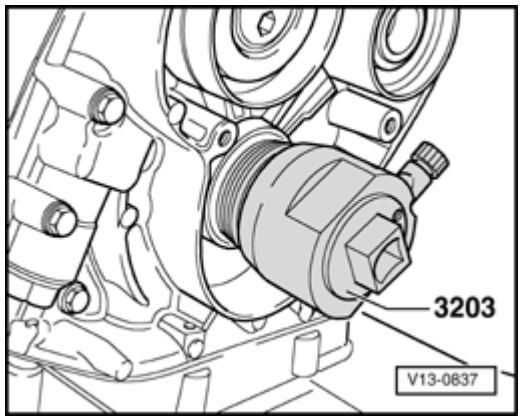
13-23

Crankshaft oil seals, replacing

A - Toothed belt end

- Remove toothed belt ⇒ Page 13-4 .

- Remove toothed belt sprocket from crankshaft

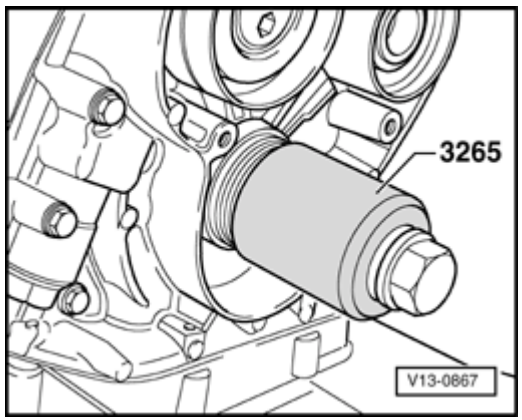


- Pull out oil seal with oil seal extractor 3203.
- Clean contact surface and sealing surface.

Note:

Do not lubricate sealing lip or outer circumference of seal before pressing in.

- Push on seal using fitting sleeve 3202/1.



- Press in seal until flush using fitting sleeve 3265 and central bolt.

13-24

B - Flywheel end

Note:

Replace oil seal together with sealing flange.

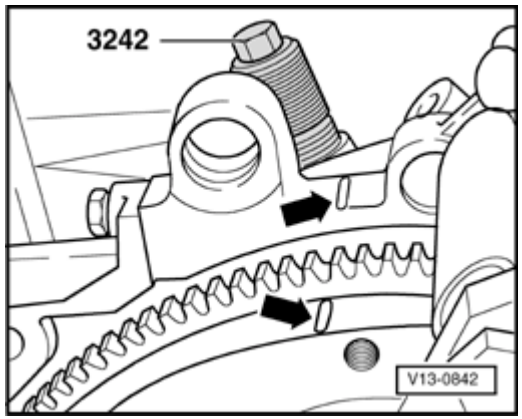
Vehicles with manual transmission

- Drain off coolant ⇒ Page 19-19 .

- Remove transmission.

⇒ *Repair Manual, 6 Spd. Manual Transmission 01E, Repair Group 34*

- Remove clutch.



- With crankshaft at TDC, screw in clamping bolt 3242.
- Mark position of flywheel relative to engine -arrows-.
- Remove dual-mass flywheel.
- Remove sealing flange.

13-25

Installing

- Install sealing flange.

- Install dual-mass flywheel with new bolts.

Note:

Always replace securing bolts for dual-mass flywheel.

- Install clutch.

⇒ *Repair Manual, 6 Spd. Manual Transmission 01E, Repair Group 30*

Tightening torques	
Dual-mass flywheel to crankshaft	60 Nm + 180°
Clutch to dual-mass flywheel	20 Nm

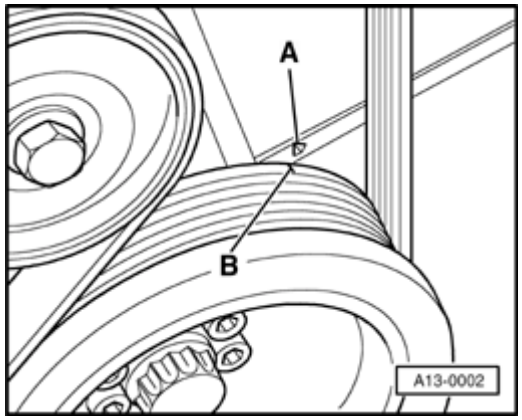
13-26

Vehicles with automatic transmission

- Remove transmission.

⇒ *Repair Manual, 5 Spd. Automatic Transmission 01V, Repair Group 37*

- Drain off coolant ⇒ Page 19-19 .



- Turn crankshaft to TDC by hand. Marks -A- and -B- must be aligned.

Note:

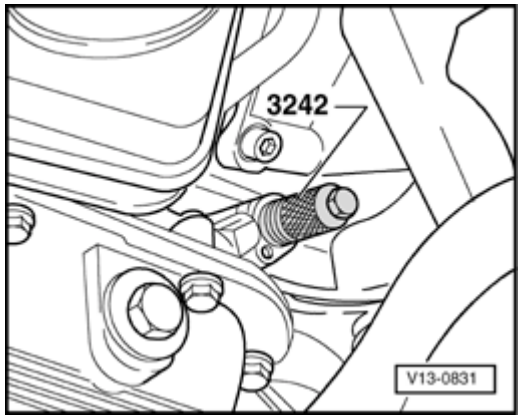
Turn over the engine at the central bolt on the crankshaft.

- Check position of camshafts: larger holes in securing plates on camshaft sprockets must align opposite one another on inside. If this is not the case, turn crankshaft one revolution further.
- Remove sealing plug from cylinder block, left.
- The TDC drilling in crankshaft must be visible (or able to be felt) in line with sealing plug hole.

CAUTION!

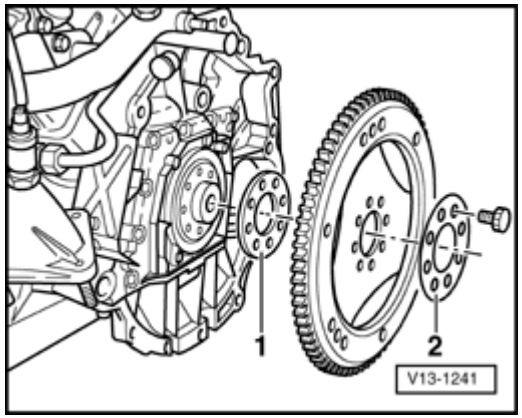
Injury risk - do not turn engine while feeling for TDC drilling.

13-27



- Screw clamping bolt 3242 for crankshaft into sealing plug hole and tighten.
- Mark positions of holes in drive plate, shim -1- and washer -2- in relation to crankshaft.
- Mark positions of shim -1- in front of drive plate and washer -2- behind drive plate.

Installing



- Install drive plate with washer -2- and shim -1- (3.0 mm or 4.0 mm).

Note:

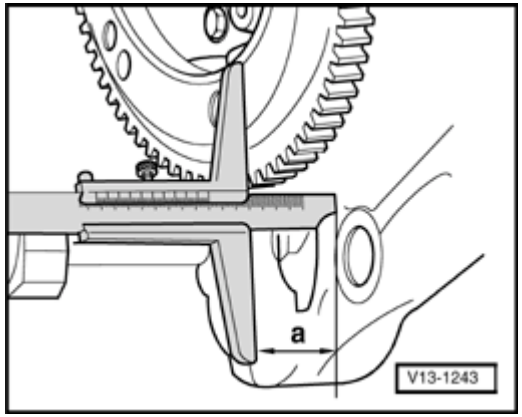
- *Short engines and exchange engines are supplied without bush in crankshaft. On vehicles with automatic transmission, always knock in new bush before installing drive plate.*
- *Always replace drive plate securing bolts.*

13-28

Tightening torques	
Drive plate to crankshaft	60 Nm + 90°

Note:

Always replace securing bolts for drive plate.



- Measure distance -a- at three points and calculate average value.
  - ♦ Distance -a- = approx. 29.9 mm.
- Install a different shim if necessary.

Note:

Before installing the transmission, check that the dowel sleeves for locating engine/transmission are fitted in the engine flange.

- Install transmission.

⇒ *Repair Manual, 5 Spd. Automatic Transmission 01V, Repair Group 37*

Dual-mass flywheel / drive plate, installation dimensions, removing and installing

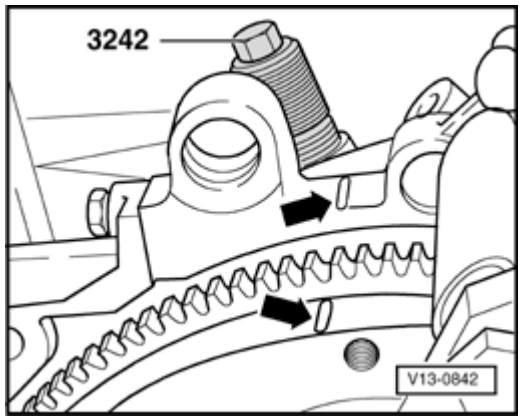
A - Flywheel

Removing

- Remove transmission.

⇒ Repair Manual, 6 Spd. Manual Transmission 01V, Repair Group 34

- Remove clutch.



- With crankshaft at TDC, screw in clamping bolt 3242.
- Mark position of flywheel relative to engine -arrows-.
- Remove bolts (bolts must be replaced).

13-30

Note:

The needle bearing is located in the flywheel and must be pressed in if a new flywheel is installed ⇒ *Page 13-35* .

Installing

- Install dual-mass flywheel.

Note:

Always replace flywheel securing bolts.

- Install clutch.

⇒ *Repair Manual, 6 Spd. Manual Transmission 01E, Repair Group 30*

- Install transmission.

⇒ *Repair Manual, 6 Spd. Manual Transmission 01E, Repair Group 34*

13-31

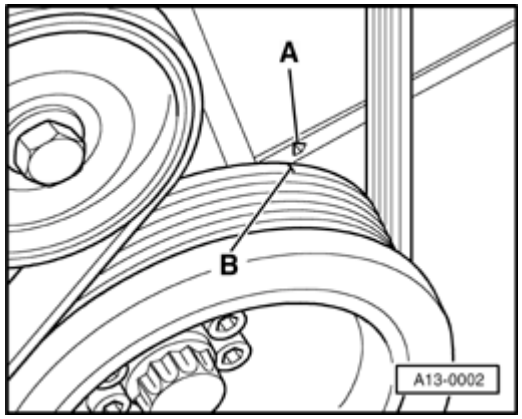
Tightening torques	
Dual-mass flywheel to crankshaft	60 Nm + 180°
Clutch to dual-mass flywheel	20 Nm

B - Drive plate

Removing

- Remove transmission.

⇒ *Repair Manual, 5 Spd. Automatic Transmission 01V, Repair Group 37*



- Turn crankshaft to TDC by hand. Marks -A- and -B- must be aligned.

Note:

Turn over the engine at the central bolt on the crankshaft.

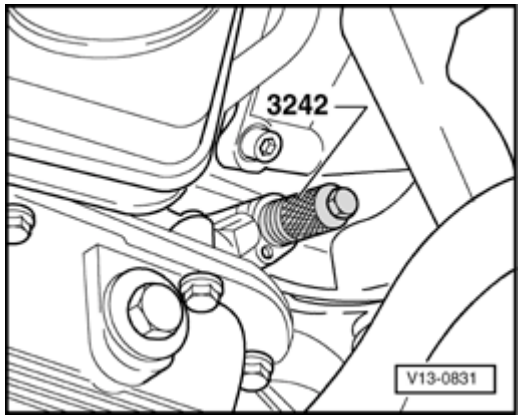
- Check position of camshafts: larger holes in securing plates on camshaft sprockets must align opposite one another on inside. If this is not the case, turn crankshaft one revolution further.
- Remove sealing plug from cylinder block, left.

13-32

- TDC drilling in crankshaft must be visible (or able to be felt) in line with sealing plug hole.

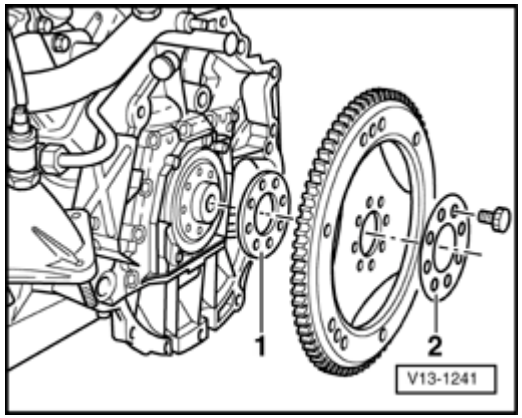
CAUTION!

Injury risk - do not turn engine while feeling for TDC drilling.



- Screw clamping bolt 3242 for crankshaft into sealing plug hole and tighten.
- Mark positions of holes in drive plate, shim -1- and washer -2- in relation to crankshaft.
- Mark positions of shim -1- in front of drive plate and washer -2- behind drive plate.

13-33



Installing

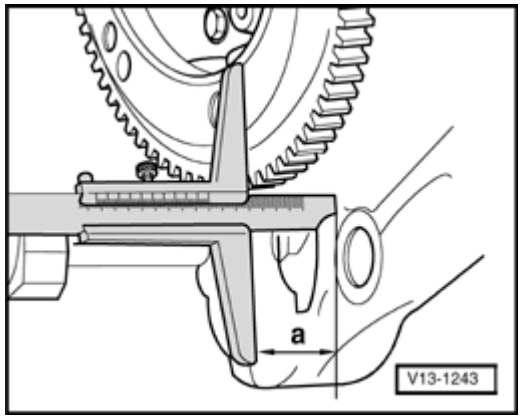
- Install drive plate with washer -2- and shim -1- (3.0 mm or 4.0 mm).

Note:

- *Short engines and exchange engines are supplied without bush in crankshaft. On vehicles with automatic transmission, always knock in new bush before installing drive plate.*
- *Always replace drive plate securing bolts.*

Tightening torques	
Drive plate to crankshaft	60 Nm + 90°

13-34



- Measure distance -a- at three points and calculate average value.
  - ♦ Distance -a- = approx. 12.3 mm.
- Install a different shim if necessary.

Note:

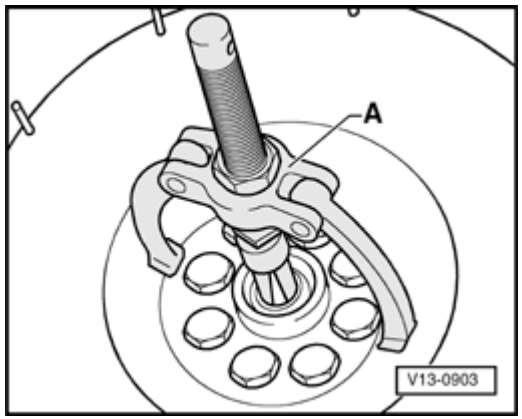
Before installing the transmission, check that the dowel sleeves for locating engine/transmission are fitted in the engine flange.

- Install transmission.

⇒ *Repair Manual, 5 Spd. Automatic Transmission 01V, Repair Group 37*

13-35

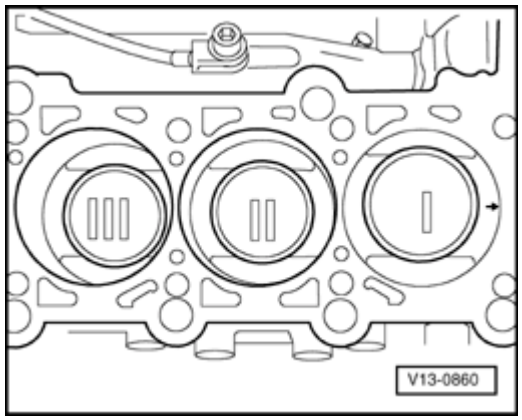
Needle bearing in dual-mass flywheel, removing and installing



- Pull out with puller, such as KUKKO 21/2 and KUKKO 22-1.
- Drive in with drift 3264.

Pistons and piston rings, installing

Pistons



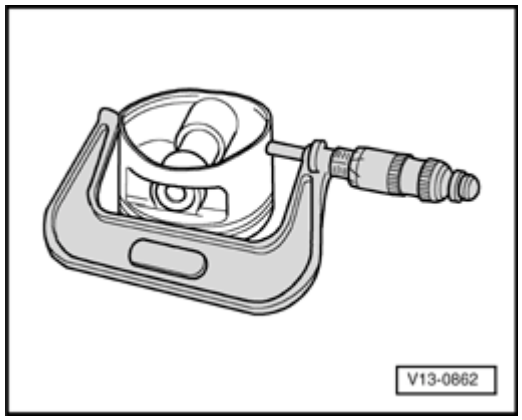
➢ Position: arrow on piston crown must always face in direction of travel.

- Mark cylinder number on piston crown with waterproof felt pen.

Note:

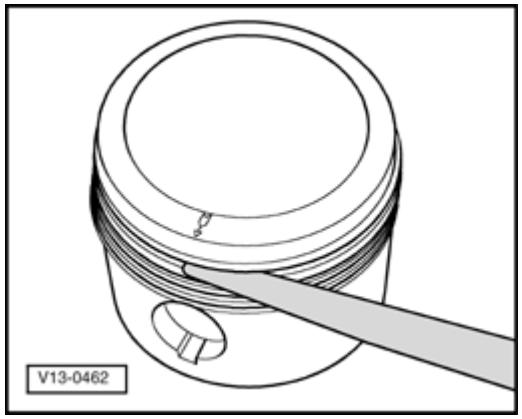
Do not use a center-punch or similar, as pistons have a special coating.

Checking piston diameter



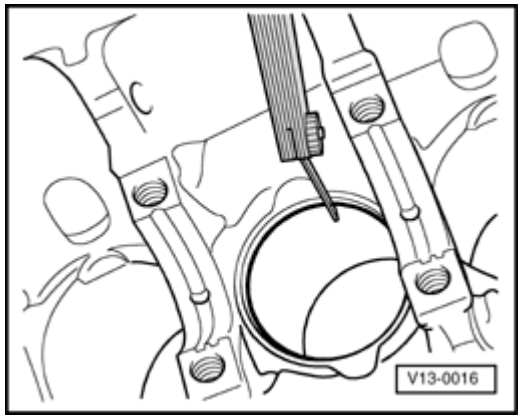
➢

- Measure pistons approx. 10 mm from bottom of skirt, at 90° to piston pin axis.
  - ♦ Difference between actual and nominal diameter: not more than 0.04 mm.



Ring-to-groove clearance

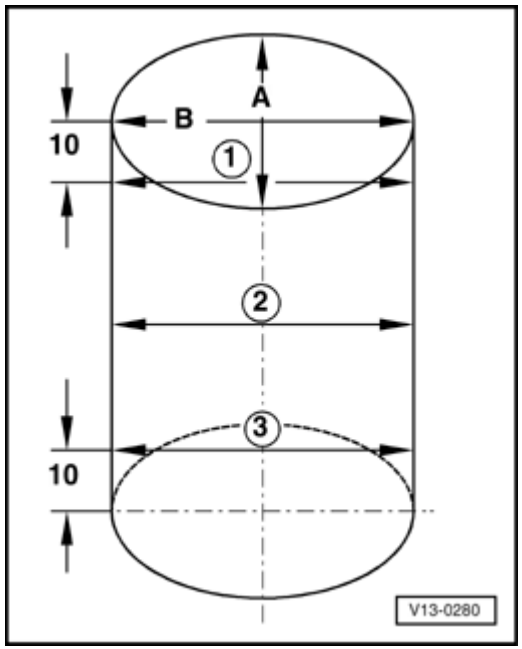
Clearance when new	Wear limit
0.02 ... 0.08 mm	0.10 mm



Checking piston ring gap

- Push ring in squarely to a position approx. 15 mm from bottom end of cylinder.

Piston ring	Gap when new	Wear limit
1	0.35 ... 0.50 mm	1.0 mm
2	0.50 ... 0.70 mm	1.4 mm
3	0.25 ... 0.50 mm	0.8 mm



Cylinder bores, checking

- Measure bores at three points in both directions: across engine -A- and in line with crankshaft -B-.

  Use internal dial gauge 50 to 100 mm.

  - Difference between actual and nominal diameter: not more than 0.08 mm.

Piston and cylinder dimensions

Honing dimension	Piston dia.	Cyl. bore dia.
Basic dimension	80.95 mm	81.01 mm

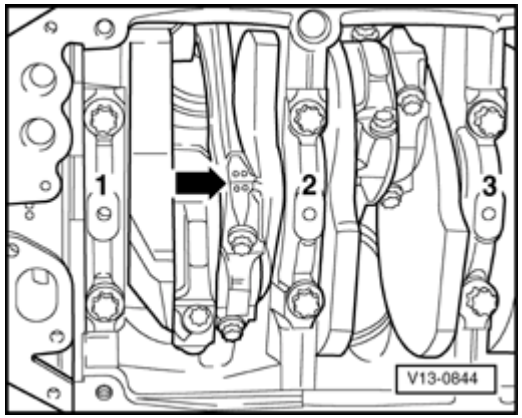
Note:

Replacement pistons are only available with basic dimension.

Connecting rods and connecting rod bearings, installing

Note:

- *Only replace complete sets of connecting rods*
- *Do not interchange connecting rod bearings.*



- Before removing, mark positions of connecting rod bearing caps with a felt pen or similar.

Checking radial clearance

- Remove connecting rod bearing cap. Clean bearing cap and bearing journal.
- Place a length of Plastigage corresponding to width of bearing on bearing journal or bearing shell.
- Install connecting rod bearing cap and tighten to 20 Nm. Do not rotate crankshaft.
- Remove connecting rod bearing cap again.
- Compare width of Plastigage with calibrated scale.

Clearance when new	Wear limit
0.015 ... 0.062 mm	0.12 mm

- Install new connecting rod bearing bolts.