

ENGINE**2.5 Liter - Crankshaft, Cylinder Block - Engine Code(s): CBTA & CBUA****13 CRANKSHAFT, CYLINDER BLOCK****GENERAL INFORMATION****NEW CONNECTING ROD, SEPARATING**

New connecting rods may not be separated at the location where they should be. If the connecting rod bearing cap cannot be removed by hand, proceed as follows:

- Mark which cylinder the connecting rod belongs to, see "Connecting Rod Cap" in item: 4.
- Lightly clamp the connecting rod in a vise equipped with aluminum protective jaw pads.

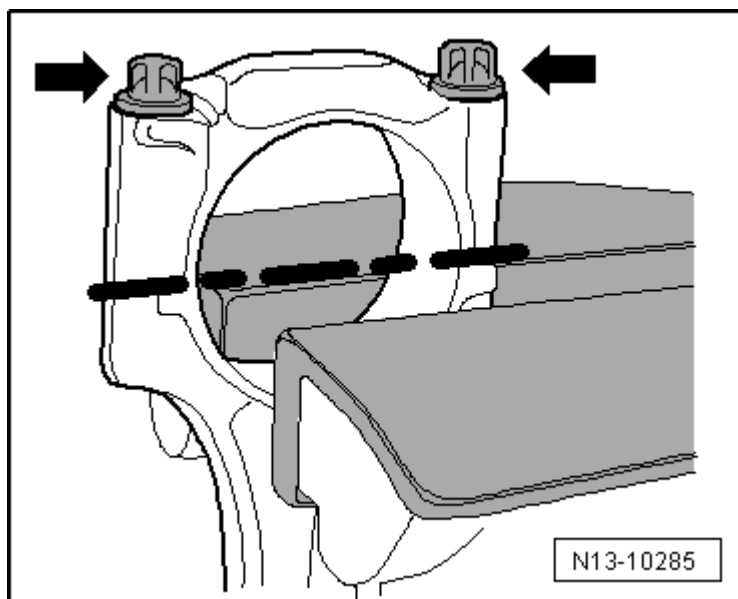


Fig. 1: Identifying Connecting Rod Clamped In Vise Equipped With Aluminum Protective Pads
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: Only clamp the connecting rod lightly to avoid damaging it.

Clamp the connecting rod below the dotted line.

-- Loosen both bolts -arrows- about five turns.

-- Carefully tap against the connecting rod bearing cap in the direction of the -arrow- with a plastic mallet until the cap is loose.

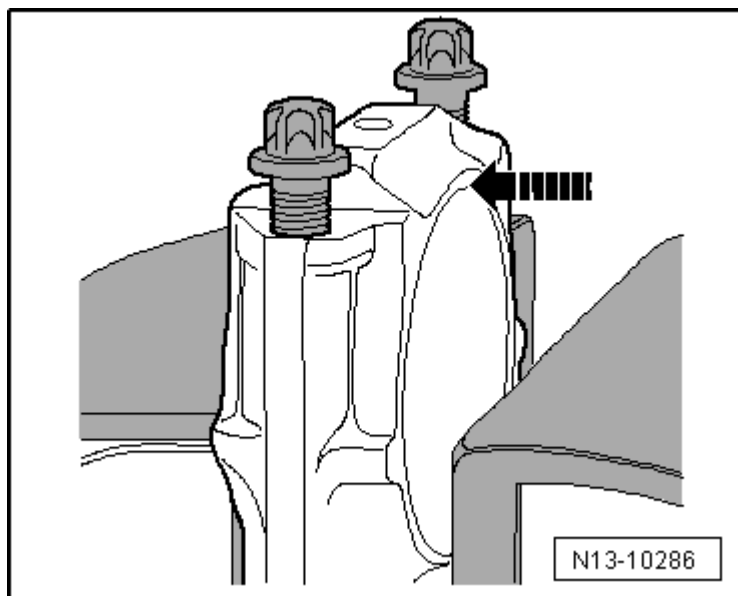


Fig. 2: Identifying Direction To Carefully Tap Against Connecting Rod Bearing Cap
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

DESCRIPTION AND OPERATION

ACCESSORY DRIVE AND CYLINDER BLOCK OVERVIEWS

NOTE: If large quantities of metal particles or abraded material are detected during engine repairs, it may mean the crankshaft or rod bearings are damaged. To prevent further damage, perform the following steps after the repair:

Clean the oil passages.

Replace the oil spray jets.

Replace the oil cooler.

Replace the oil filter.

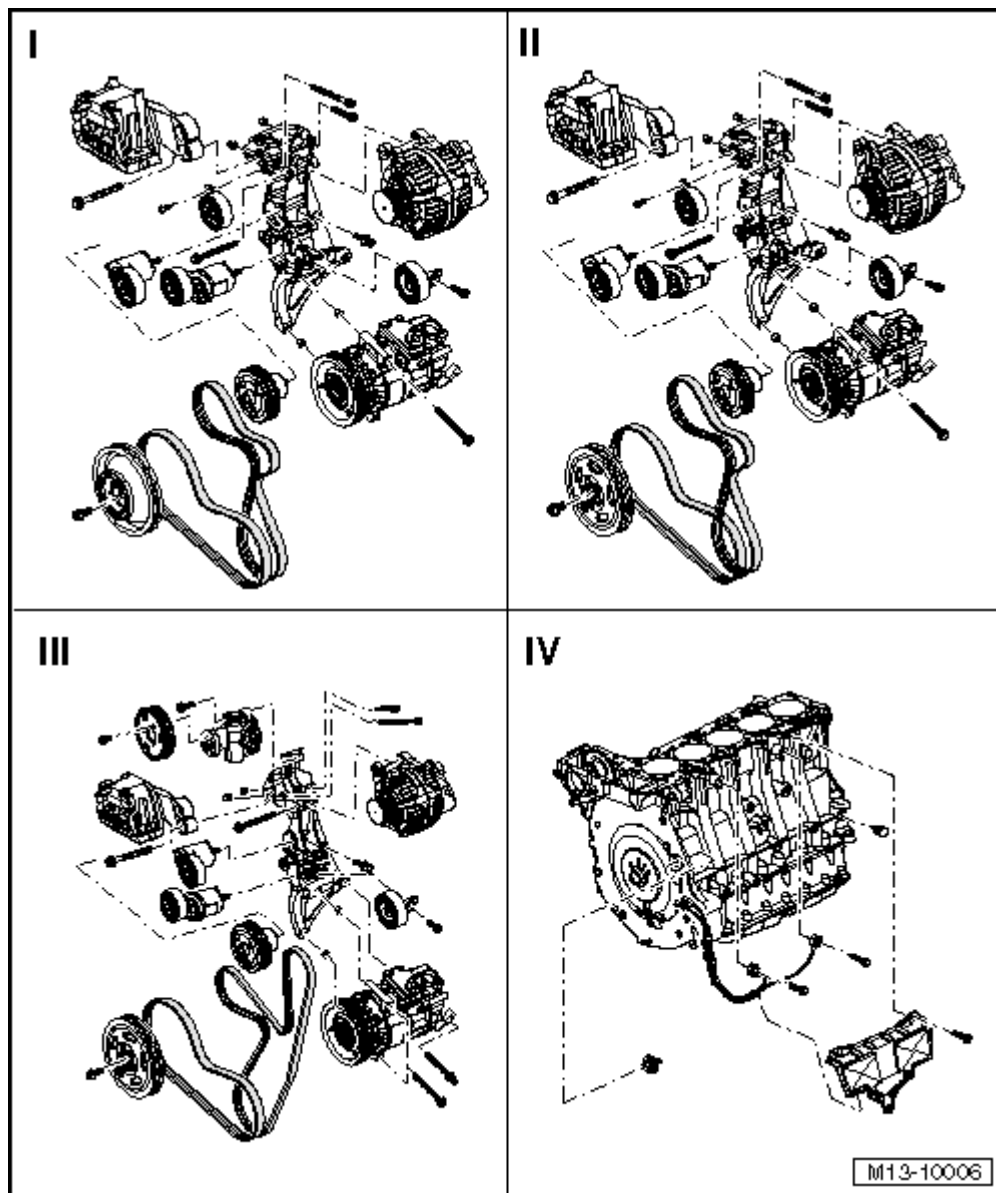


Fig. 3: Identifying Accessory Drive And Cylinder Block Overviews (1 Of 2)
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. - Jetta from MY 05 through 07, with engine codes BGP and BGQ
2. - Jetta from MY 08 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10, with engine codes CBTA and CBUA

ACCESSORY DRIVE

3. - Jetta from MY 11
4. - **ENGINE, REAR**

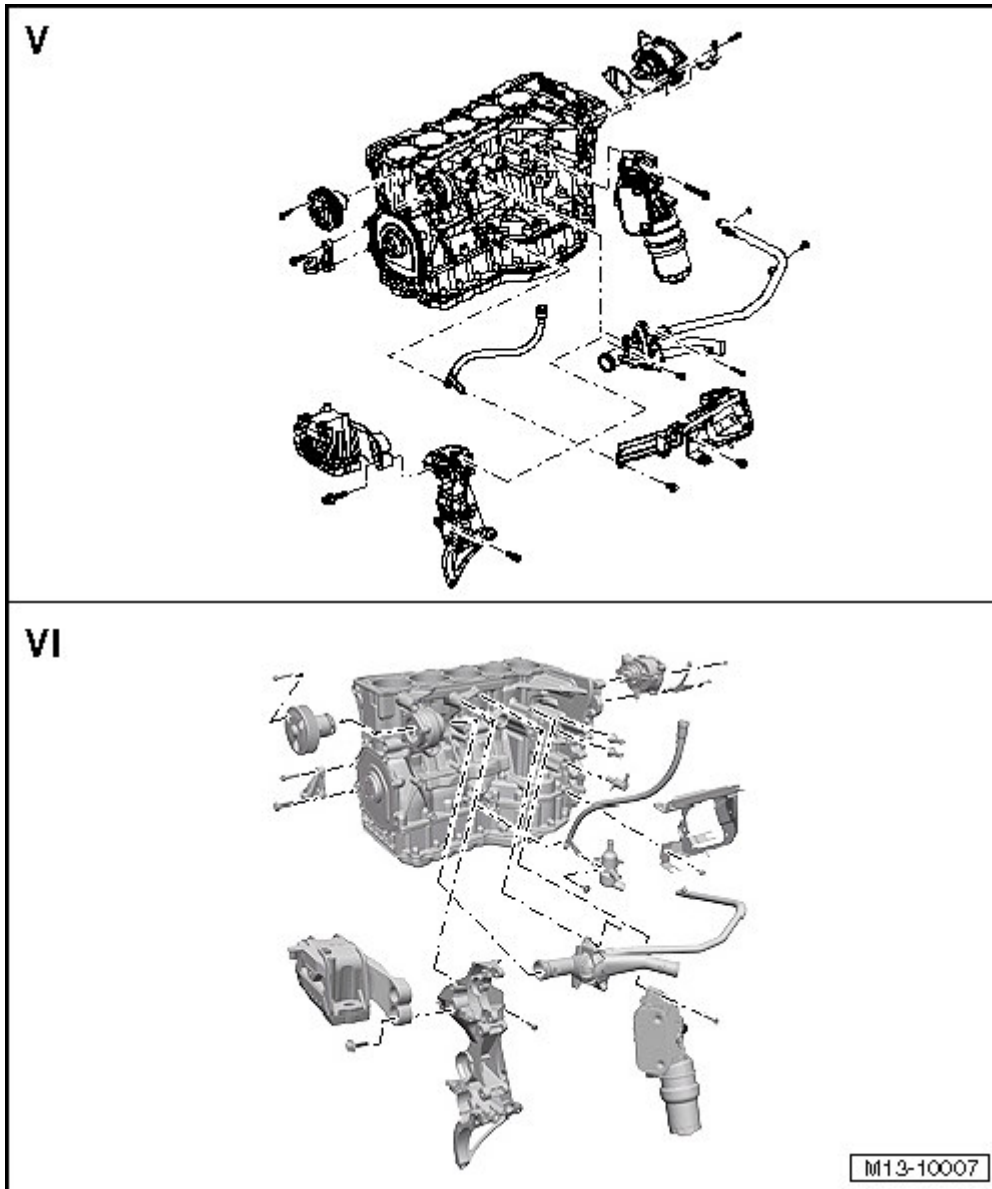


Fig. 4: Identifying Accessory Drive And Cylinder Block Overviews (2 Of 2)

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. - Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10 **ENGINE, FRONT AND SIDE**
2. - Jetta from MY 11

ACCESSORY DRIVE

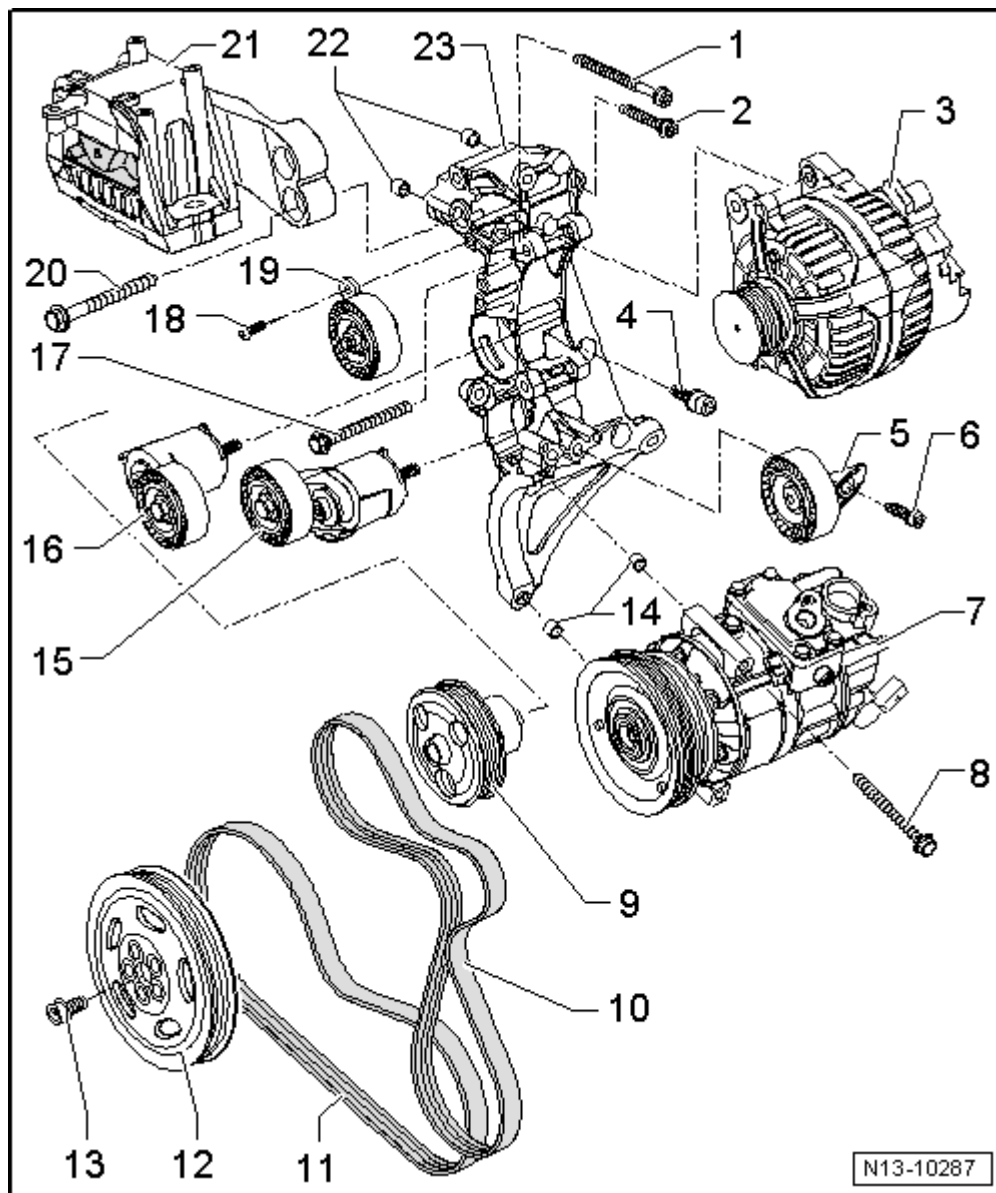


Fig. 5: Identifying Accessory Drive

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Bolt

- 25 Nm

2. Bolt

- 25 Nm

3. Generator

- Removing and installing, refer to **Removal and Installation**.
- Moving the threaded bushings in the generator slightly to the rear will make it easier to install the generator.

4. Bolt

- 25 Nm

5. Idler Pulley wit Bracket

- For the Air Conditioning (A/C) compressor ribbed belt.
- Do not remove the pulley.

6. Bolt

- 25 Nm

7. A/C Compressor

- Removing and installing, refer to Removal and Installation .

8. Bolt

- 25 Nm

9. Coolant Pump

- In the cylinder block.
- Removing and installing, refer to COOLANT PUMP .

10. Ribbed Belt, for the Generator and Coolant Pump

- Routing, refer to Fig. 6.
- Before removing, mark the direction of rotation using chalk or a felt-tip marker.

CAUTION: When installing the old ribbed belt, make sure it is routed in the right direction and that it is seated correctly on the pulleys and the tensioner.

- Check for wear.
- Do not kink.
- Removing and installing, refer to RIBBED BELT.

11. Ribbed Belt, for the A/C Compressor

- Routing, refer to Fig. 6.
- Before removing, mark the direction of rotation using chalk or a felt-tip marker.

CAUTION: When installing the old ribbed belt, make sure it is routed in the right direction and that it is seated correctly on the pulleys and the tensioner.

- Check for wear.
- Do not kink.
- Removing and installing, refer to RIBBED BELT.

12. Vibration Damper

- Multiple versions are available.
- To remove and install, lock the crankshaft CRANKSHAFT, LOCKING.

13. Bolt

- 50 Nm + 90° (1/4) additional turn.
- Always replace.
- Only use strength category 10.9.
- Quantity: 5

14. Bushing

- Quantity: 2

15. Belt Tensioner, for the A/C Compressor Ribbed Belt

- 35 Nm
- Do not remove the roller.

16. Belt Tensioner, for the Generator and Coolant Pump Ribbed Belt

- 35 Nm
- Do not remove the roller.

17. Bolt

- 25 Nm

18. Bolt

- 8 Nm

19. Upper Idler Pulley with Bracket

- For the generator and coolant pump ribbed belt.
- Do not remove the pulley.

20. Bolt

- 40 Nm + 90° (1/4) additional turn.
- Always replace.

21. Engine Mount**22. Bushing**

- Quantity: 2

23. Accessory Bracket

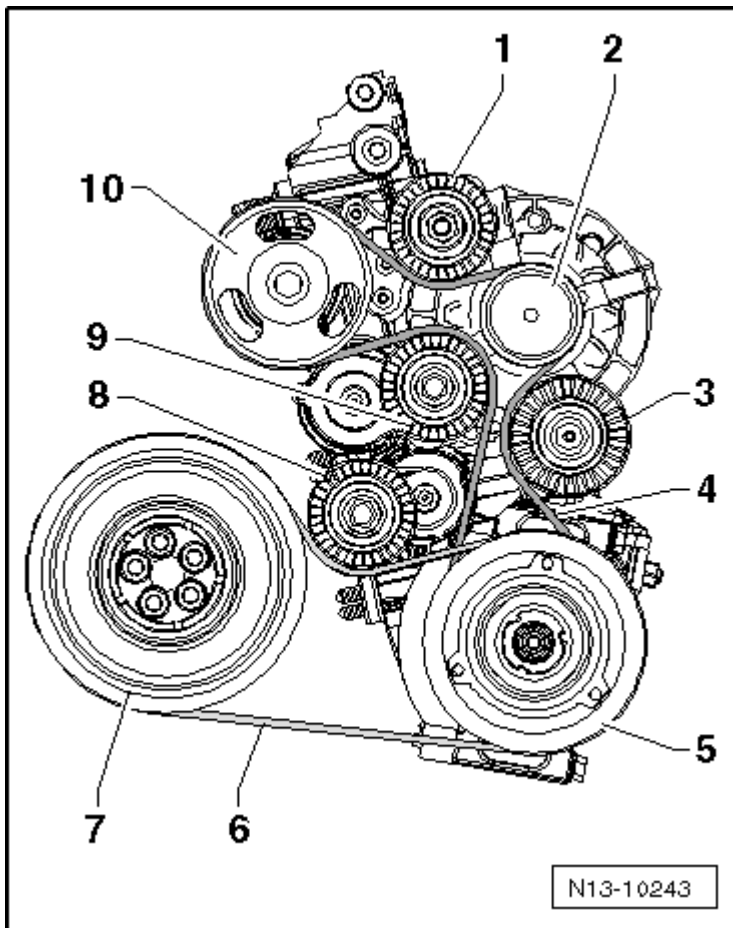


Fig. 6: Identifying Ribbed Belt Routing

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Upper idler pulley
2. Pulley, generator
3. Lower idler pulley
4. Ribbed belt, for the generator and coolant pump
5. Pulley, A/C compressor
6. Ribbed belt, for the A/C compressor
7. Vibration damper
8. Belt tensioner, for the A/C compressor ribbed belt
9. Belt tensioner, for the generator and coolant pump ribbed belt
10. Pulley, coolant pump

ENGINE, REAR

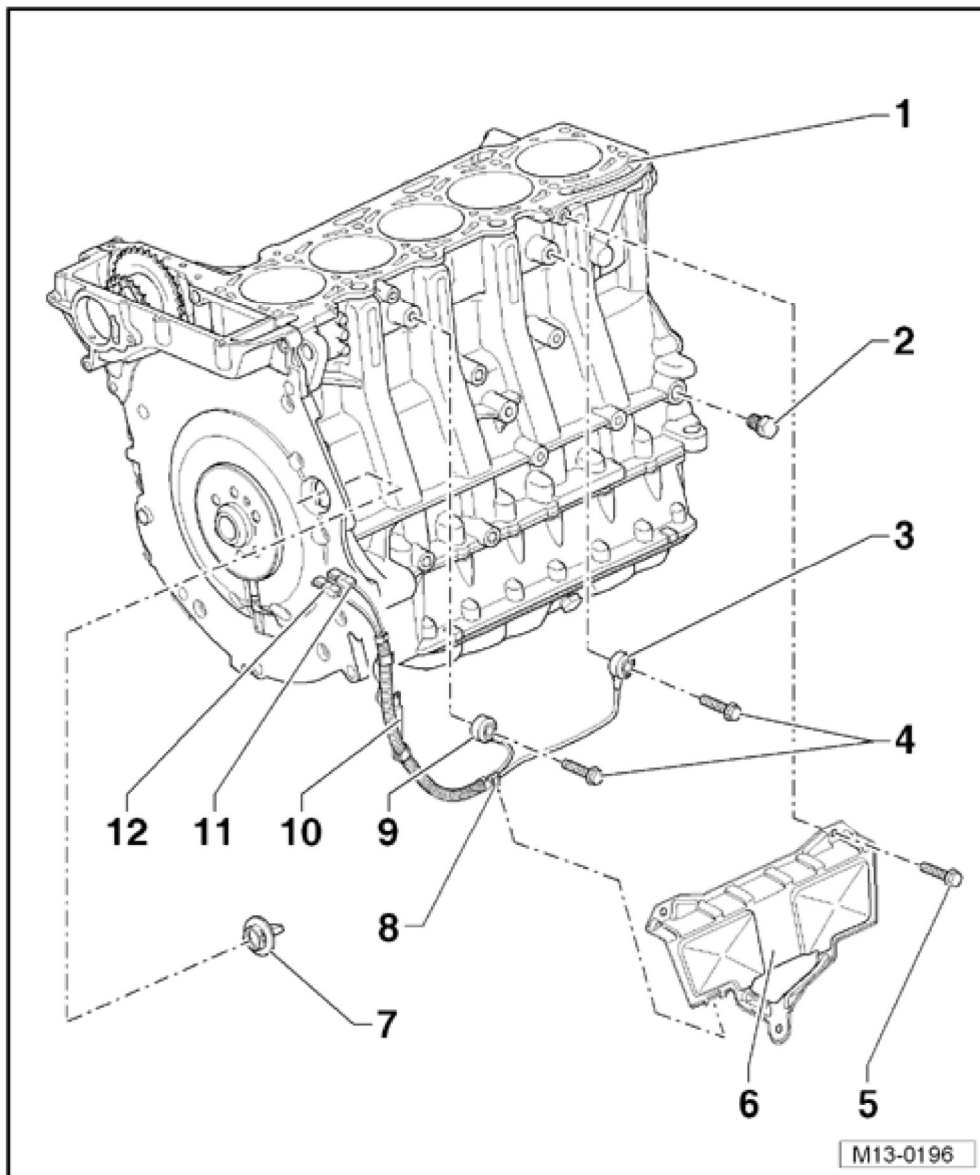


Fig. 7: Identifying Rear Engine Overview

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. **Cylinder Block**
2. **Locking Bolt**
 - 30 Nm
 - With a rolled seal.
 - The bore in the cylinder block is for locking the crankshaft using the locking pin T40069.
3. **Knock Sensor 1 -G61-**
 - Note the installed position: The wire connection points downward vertically.
4. **Bolt**
 - 20 Nm

- Tightening specification affects the function of the knock sensor.
5. **Bolt**
 - 10 Nm
 6. **Cover**
 7. **Bayonet Connection**
 8. **Wire Clip**
 - Clipped to the cover.
 9. **Knock Sensor 2 -G66-**
 - Note the installed position: The wire connection points 45° toward the right on the outside.
 10. **Wire Bracket**
 - Bolted to Secondary Air Injection (AIR) valve.
 11. **Connector**
 - Green for the knock sensor 1.
 - Installed location, refer to **Fig. 8**.
 - Contacts are gold plated.
 12. **Connector**
 - Gray for knock sensor 2.
 - Installed location, refer to **Fig. 8**.
 - Contacts are gold plated.

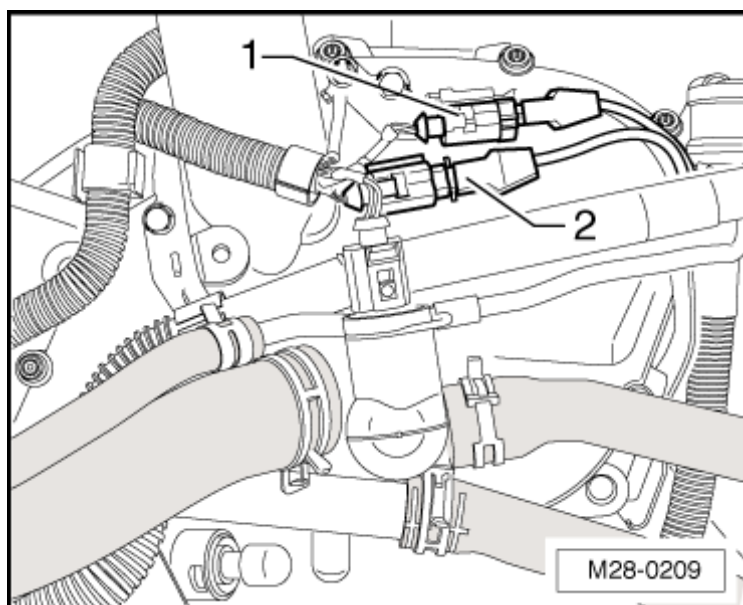


Fig. 8: Identifying Installation Position Of Harness Connectors For Knock Sensors
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. **Green for the knock sensor 1**
2. **Gray for the knock sensor 2**

ENGINE, FRONT AND SIDE

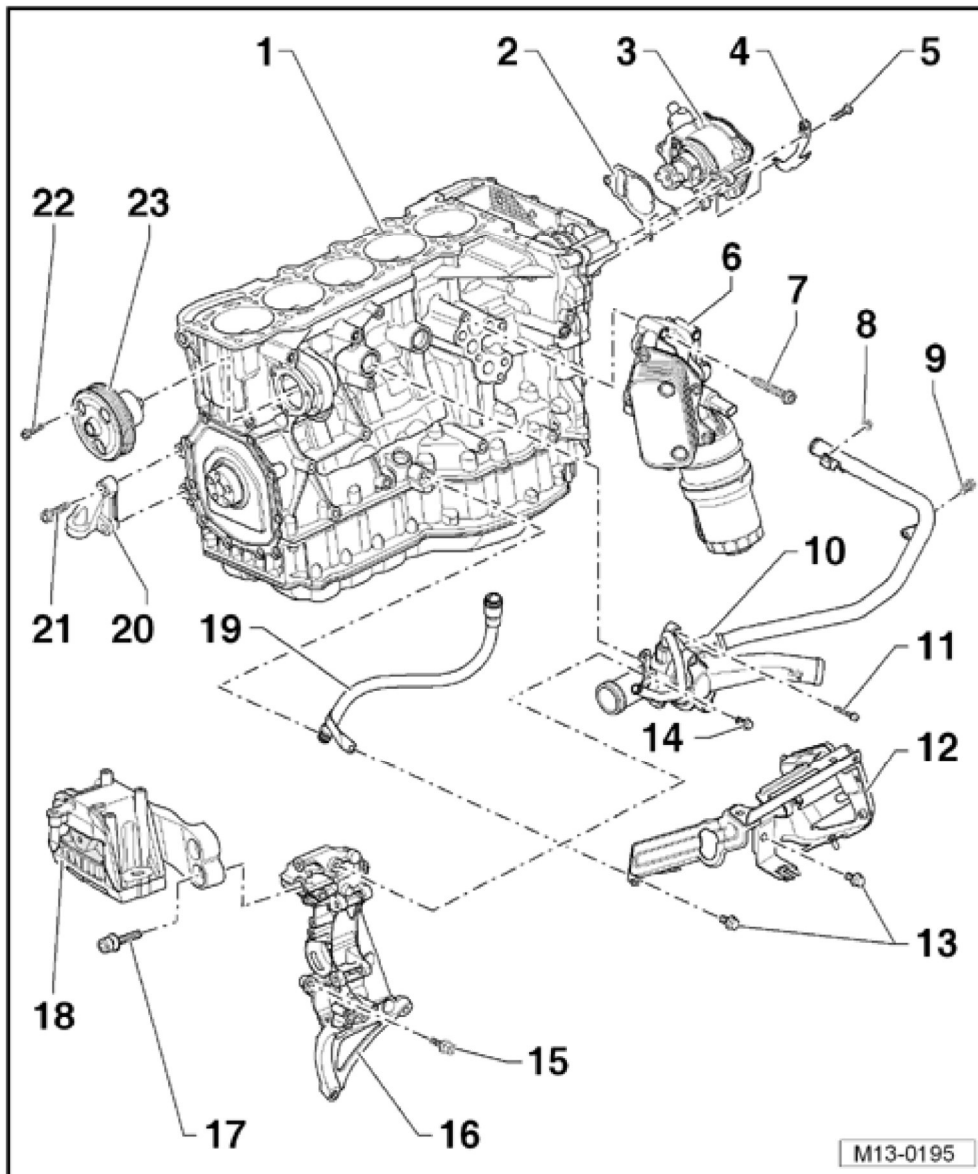


Fig. 9: Identifying Engine Front/Side Overview
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. **Cylinder Block**
2. **Gasket**
 - Always replace.
3. **Vacuum Pump, for the Brake Booster**
 - Do not open.
 - Removing and installing, refer to **BRAKE BOOSTER VACUUM PUMP.**
4. **Bracket**
5. **Bolt**

- 10 Nm
- 6. **Oil Filter Bracket**
 - Overview, refer to **OIL FILTER BRACKET WITH ATTACHMENTS OVERVIEW** .
- 7. **Bolt**
 - 25 Nm
- 8. **Bolt**
 - 10 Nm
- 9. **Bolt**
 - 10 Nm
- 10. **Thermostat Housing**
 - With the thermostat and coolant pipe.
- 11. **Bolt**
 - 10 Nm
- 12. **Intake Manifold Support**
 - For engines with a Secondary Air Injection (AIR) system only.
- 13. **Bolt**
 - 25 Nm
- 14. **Bolt**
 - 10 Nm
- 15. **Bolt**
 - 25 Nm
- 16. **Accessory Bracket**
- 17. **Bolt**
 - 40 Nm + 90° (1/4) additional turn.
 - Always replace.
- 18. **Engine Mount**
- 19. **Guide Tube**
 - For the oil dipstick.
- 20. **Transport Strap**
 - Not needed for service.
- 21. **Bolt**
 - 25 Nm
- 22. **Bolt**
 - 10 Nm
- 23. **Coolant Pump**
 - With a integrated silicone seal for the cylinder block seal.
 - Removing and installing, refer to **COOLANT PUMP** .

TIMING CHAIN OVERVIEWS

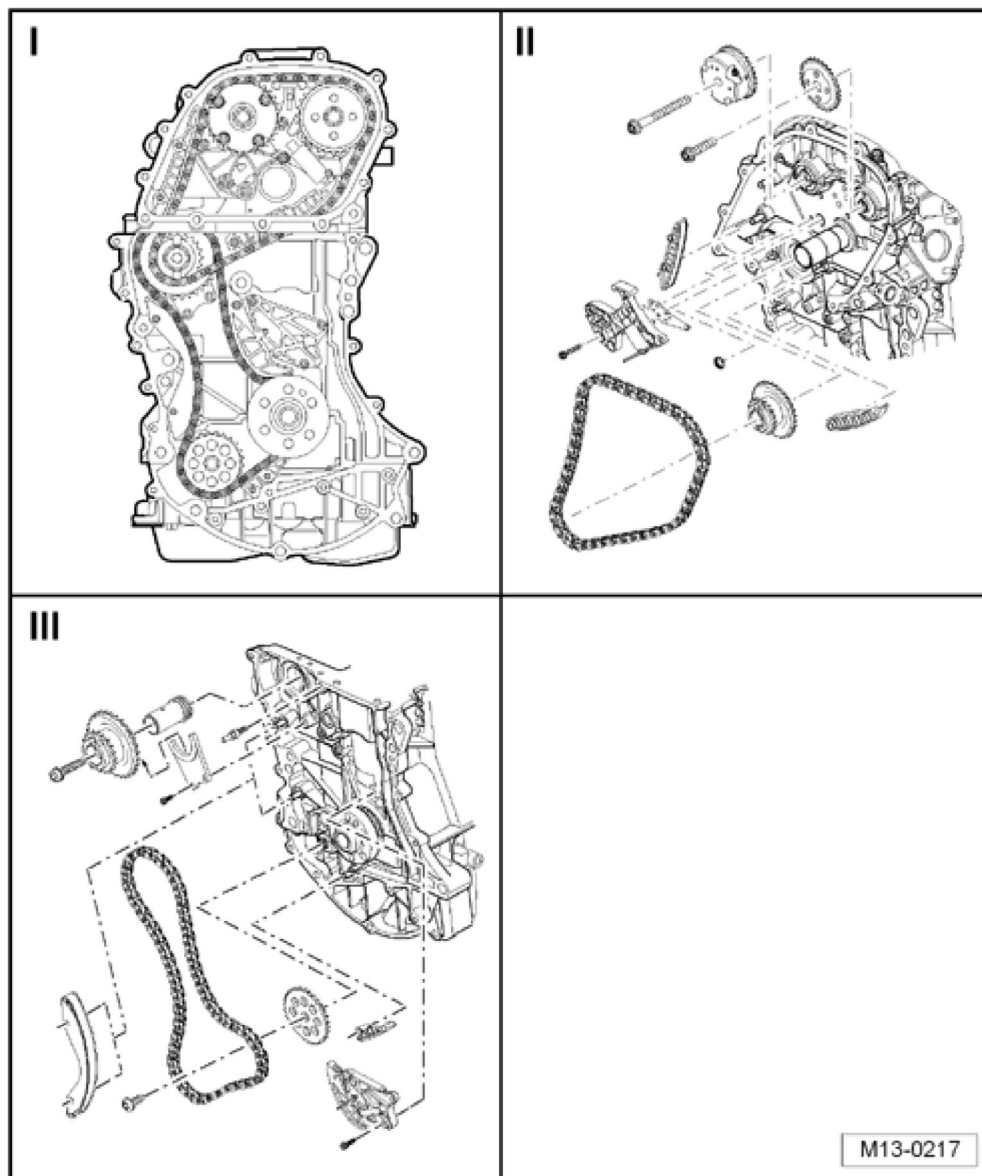
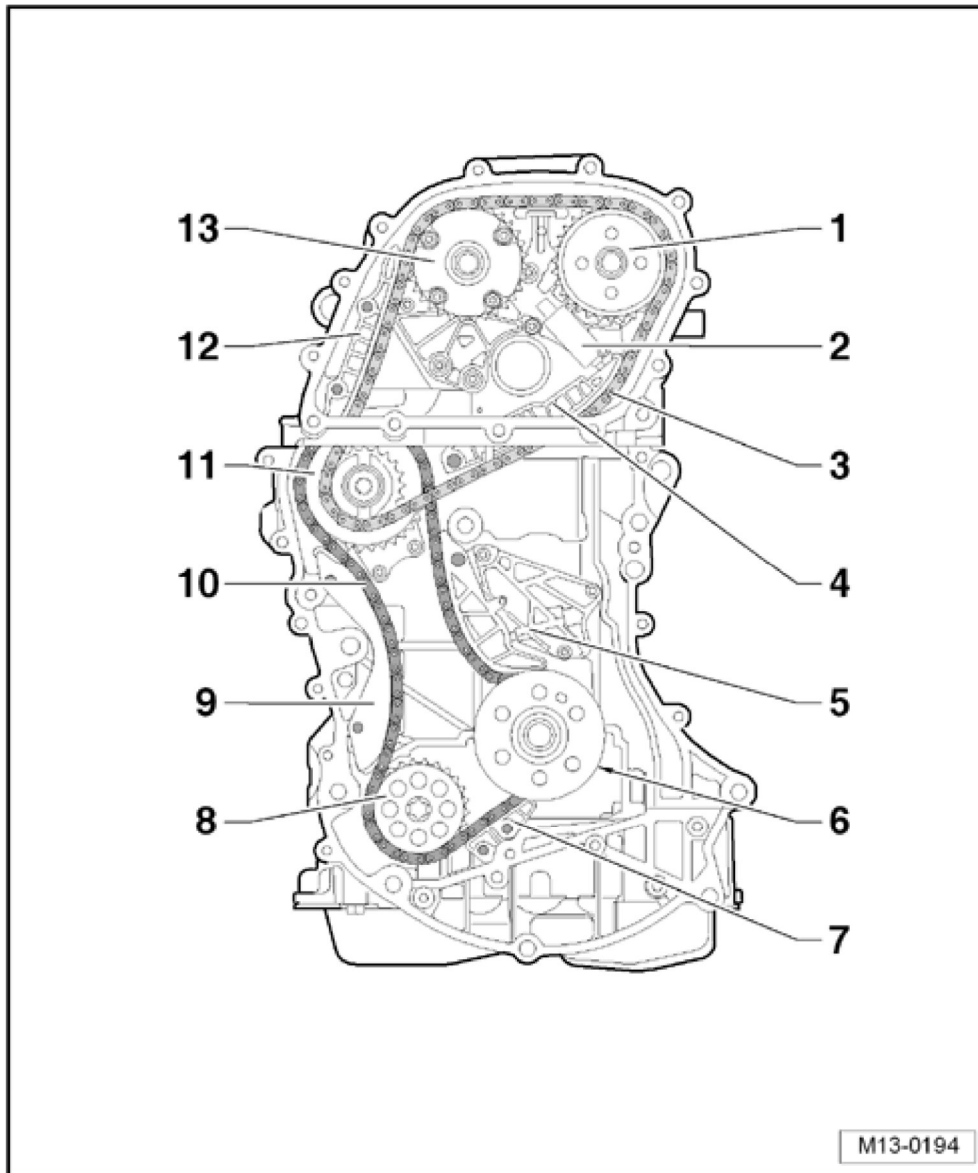


Fig. 10: Identifying Chain Drive, Assembly Overview - Part I, II, III
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. I - **ROUTING OVERVIEW**
2. II - **TIMING CHAIN, CAMSHAFTS**
3. III - **TIMING CHAIN, OIL PUMP**

ROUTING OVERVIEW



M13-0194

Fig. 11: Identifying Chain Drive, Assembly Overview
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. **Sprocket, for the Exhaust Camshaft**
2. **Chain Tensioner, for the Camshaft Timing Chain**
 - At the top, with a sliding insert.
3. **Timing Chain, for the Camshafts**
4. **Tensioning Rail, for the Camshaft Timing Chain**
 - For the chain tensioner.
 - Secured to the cylinder block.
5. **Chain Tensioner, for the Oil Pump Timing Chain**
 - With a tensioning rail.

6. **Sprocket, for the Crankshaft**
 - Component of the crankshaft.
7. **Guide Rail, for the Oil Pump Timing Chain**
 - Secured to the upper oil pan.
8. **Sprocket, for the Oil Pump**
 - Removing and installing, refer to
 - Engine codes CBTA and CBUA, refer to **OIL PUMP** .
9. **Guide Rail, for the Oil Pump Timing Chain**
10. **Timing Chain, for the Oil Pump**
 - From MY 08 the roller chain has been changed to a toothed chain.
11. **Double Sprocket, for the Camshaft and Oil Pump Timing Chains**
12. **Glide Rail, for the Camshaft Timing Chain**
13. **Camshaft Adjuster, for the Intake Camshaft**
 - With the sprocket.

TIMING CHAIN, CAMSHAFTS

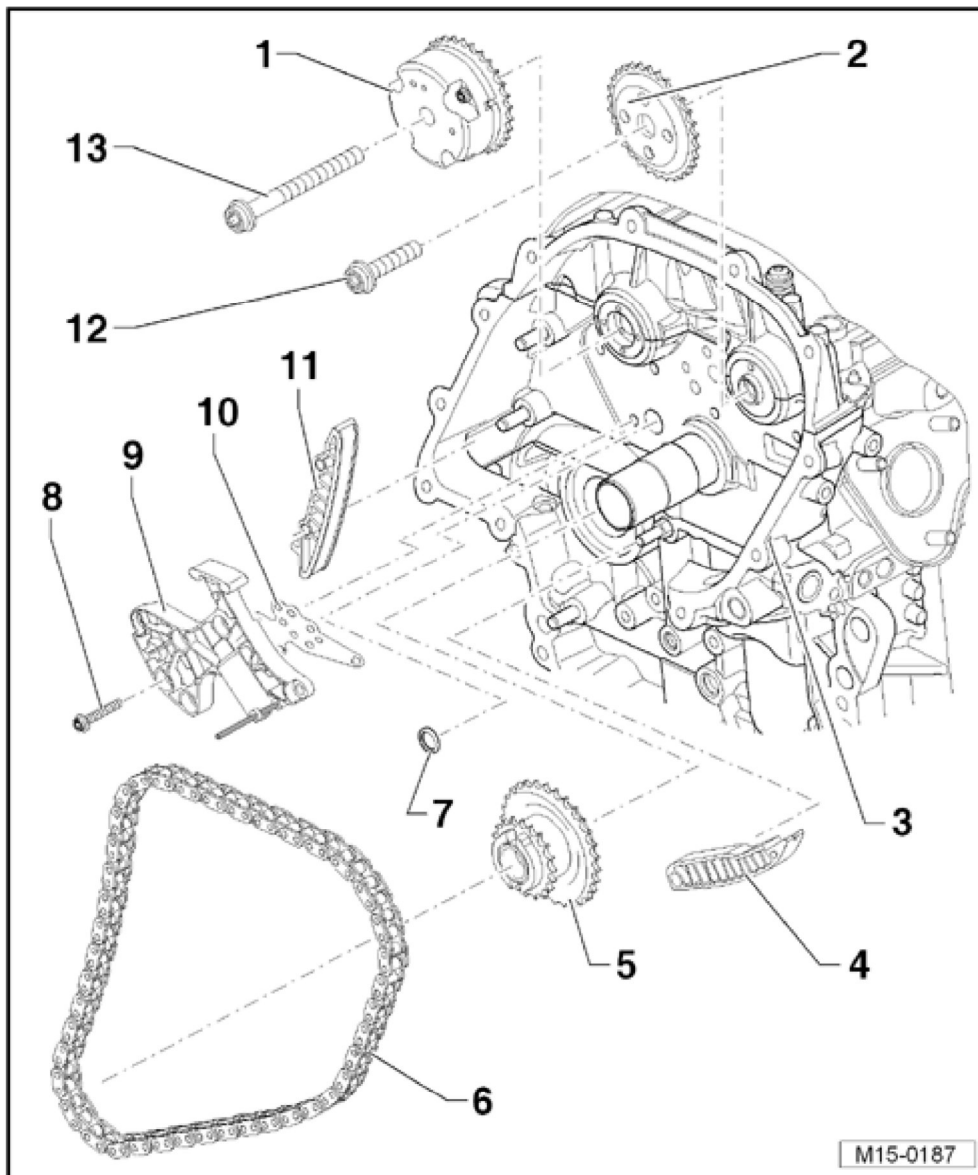


Fig. 12: Identifying Chain Drive / Timing Chain Assembly Overview
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. **Camshaft Adjuster, for the Intake Camshaft**
 - With a sprocket.
 - Do not disassemble.
2. **Sprocket, for the Exhaust Camshaft**
 - Not pressed on the camshaft.
 - When removing, press off lightly if necessary.
3. **Cylinder Head**
4. **Tensioning Rail**
 - For chain tensioner.

- Secured to the cylinder block.
- Lubricate before installing the pin.

5. Double Sprocket

- Securing, refer to **TIMING CHAIN, OIL PUMP.**

6. Timing Chain

- Removing:

-- The procedure is the same as for "Valve Timing, Adjusting". Refer to **VALVE TIMING, ADJUSTING** .

-- Remove the vacuum pump. Refer to **BRAKE BOOSTER VACUUM PUMP.**

-- Mark the direction of travel.

- Note when installing:

-- Install in the original direction of rotation.

-- The chain must lie correctly in the tensioning and guide rails.

-- Adjust the valve timing. Refer to **VALVE TIMING, ADJUSTING** .

7. Strainer

- Always replace.

8. Bolt

- 10 Nm

9. Chain Tensioner

- Secure using the locking pins T03006.

10. Gasket

- Always replace.

11. Guide Rail

- Lubricate before installing the pin.

12. Bolt

- 60 Nm + 90° (1/4) additional turn.
- Always replace.

13. Bolt

- 60 Nm + 90° (1/4) additional turn.
- Always replace.

TIMING CHAIN, OIL PUMP

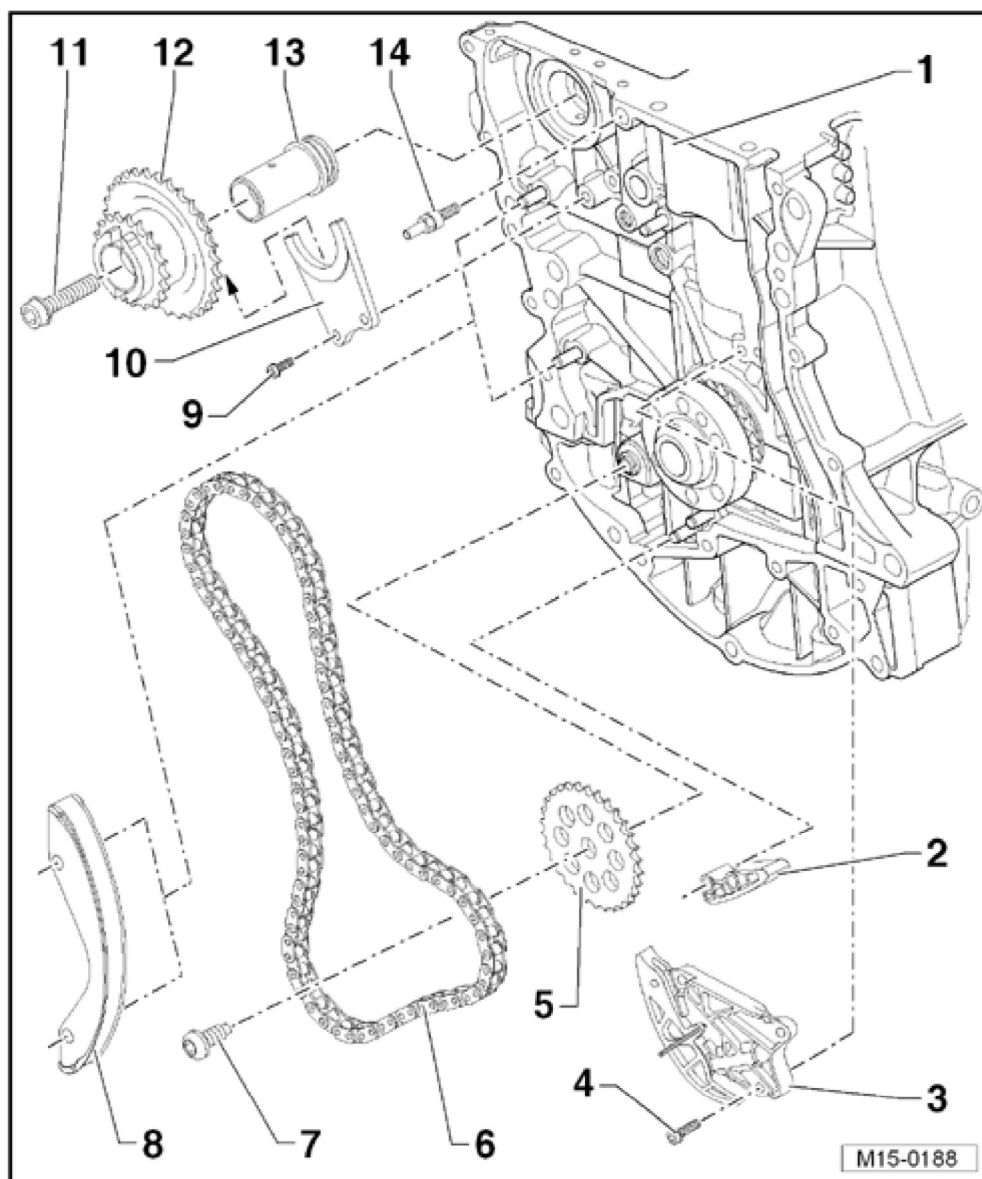


Fig. 13: Identifying Timing Chain & Oil Pump Assembly Overview
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. **Cylinder Block**
2. **Guide Rail**
 - Secured to the upper oil pan.
 - Lubricate before installing the pin.
3. **Chain Tensioner**
 - Secure using the locking pins T10115.
4. **Bolt**
 - 10 Nm
5. **Sprocket, for the Oil Pump**

- Removing and installing, refer to
 - Engine codes CBTA and CBUA, refer to **OIL PUMP** .

6. Timing Chain, for the Oil Pump

- From MY 08 the roller chain has been changed to a toothed chain.
- Removing:
 - Remove the engine.
 - Remove the control housing cover.
 - Remove the timing chain.
 - Remove the chain tensioner, refer to "Chain Tensioner" in item: 3.
 - Mark the direction of travel.
- Note when installing:
 - Install in the original direction of rotation.
 - The chain must lie correctly in the tensioning and guide rails.
 - Adjust the valve timing. Refer to **VALVE TIMING, ADJUSTING** .

7. Bolt

- 20 Nm + 90° (1/4) additional turn.
- Always replace

8. Guide Rail

- Lubricate before installing the pin.

9. Bolt

- 10 Nm

10. Mount

- Engages in the groove in the sprocket, refer to "Double Sprocket" in item: 12.

11. Bolt

- 60 Nm + 90° (1/4) additional turn.
- Always replace.

12. Double Sprocket

- Lubricate the journal before installing.
- Lubricate the groove for the mount, refer to "Mount" in item: 10.

13. Gear Shaft**14. Threaded Pin**

- 40 Nm

- For the chain tensioner for the oil pump timing chain.

SEALING FLANGE AND DRIVE PLATE/FLYWHEEL OVERVIEW

NOTE: For repairs to the clutch, refer to [For transmission(s) 0A4] Clutch .

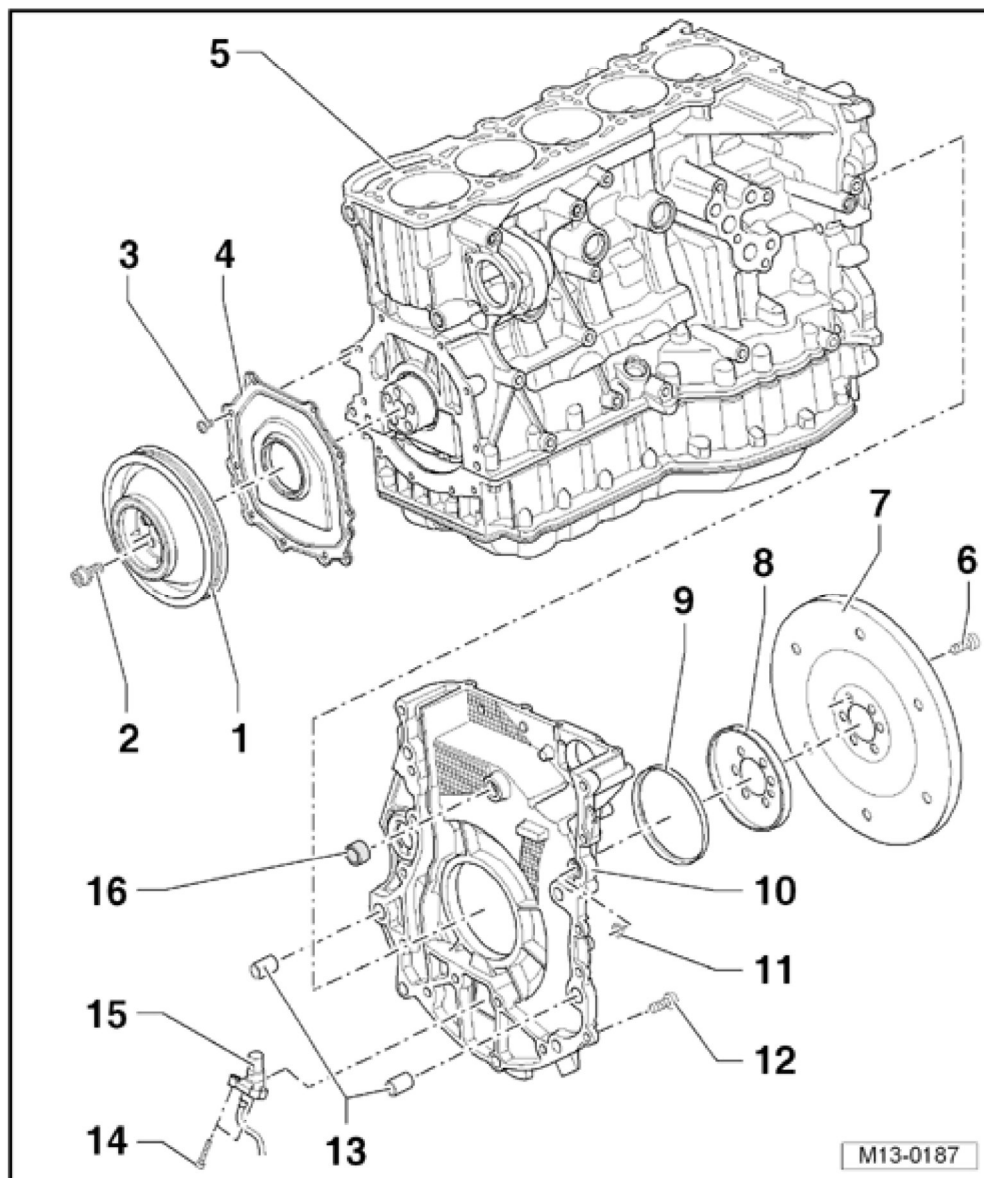


Fig. 14: Identifying Sealing Flange And Drive Plate/Flywheel Overview
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Vibration Damper

- Multiple versions are available.

2. Bolt

- 50 Nm + 90° (1/4) additional turn.

- Always replace.
 - Only use a strength category 10.9.
 - Quantity: 5
3. **Bolt**
- 10 Nm
4. **Sealing Flange, Belt Pulley Side**
- With a integrated seal.
 - Removing and installing, refer to **SEALING FLANGE, BELT PULLEY SIDE**.
5. **Cylinder Block**
6. **Bolt**
- 60 Nm + 90° (1/4) additional turn.
 - Always replace.
7. **Drive Plate/Flywheel**
- To remove, lock the crankshaft using the locking pin T40069.
 - The flywheel must not be pried off or the timing housing cover will be damaged.
 - Drive plate removing and installing, refer to **DRIVE PLATE**.
8. **Sensor Wheel**
- For the engine speed sensor.
 - With position holder.
9. **Crankshaft Seal, Transmission Side**
- Removing and installing, refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE**.
10. **Control Housing Cover**
- Removing and installing, refer to **CONTROL HOUSING COVER**.
11. **O-ring**
- Always replace.
12. **Bolt**
- 25 Nm
13. **Alignment Sleeves**
14. **Bolt**
- 5 Nm
15. **Engine Speed Sensor -G28-**
16. **Seal**
- Always replace.

CRANKSHAFT OVERVIEW

NOTE: **The engine is to be secured to the engine lateral bracket T03001 when performing assembly work.**

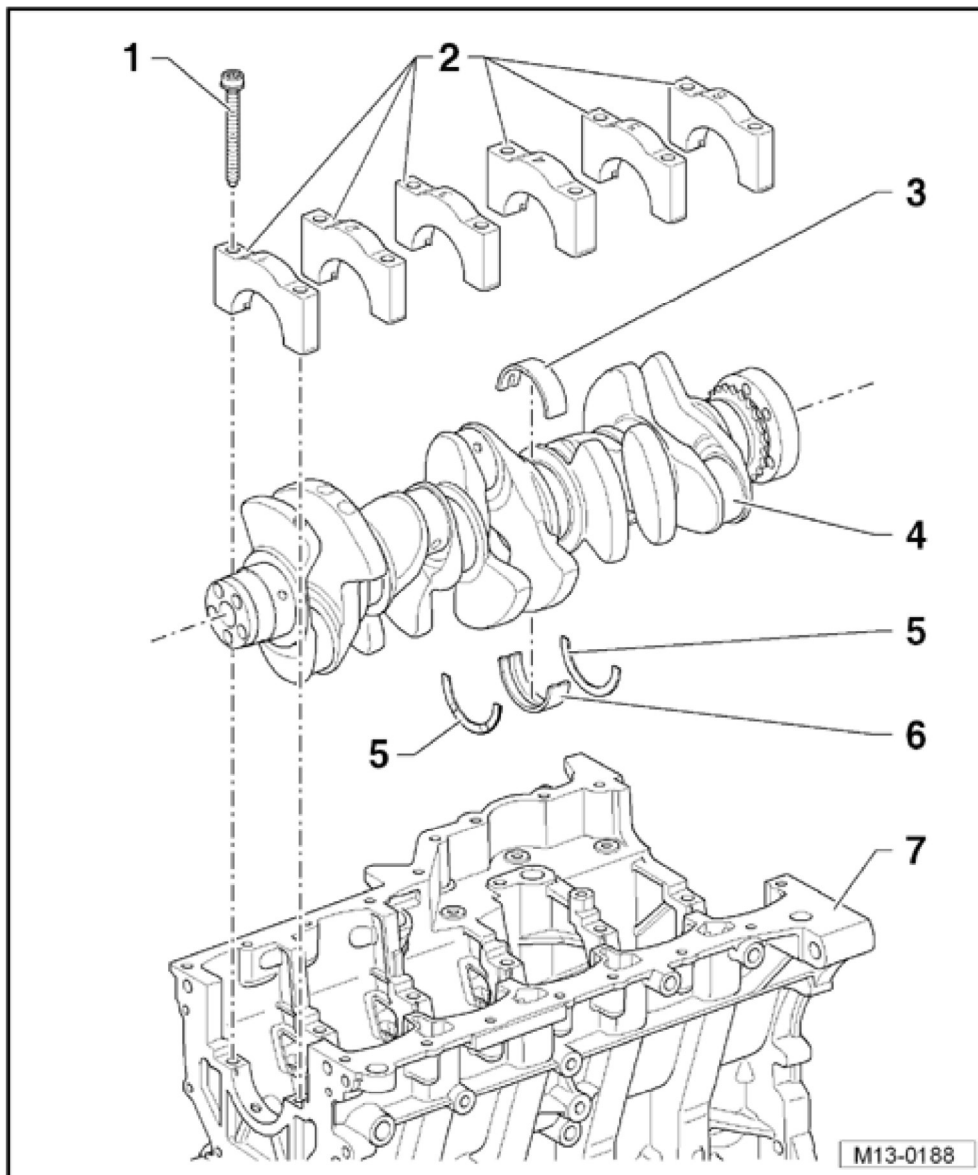


Fig. 15: Identifying Crankshaft Assembly Overview
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Bolt

- 40 Nm + 90° (1/4) additional turn.
- Always replace.
- Fully threaded.
- Tighten to 40 Nm (but not any further) to measure the radial play in the crankshaft.

2. Bearing Cap

- Bearing cap 1: Belt pulley side.
- Retaining tabs on the bearing shells and cylinder block/bearing caps must align above one another.

3. Bearing Shell, for the Bearing Cap

- Without a lubricating groove.
- Do not interchange used bearing shells (mark them).

4. Crankshaft

- Axial play new: 0.07 - 0.21 mm.

Wear limit: 0.30 mm

- Measure radial clearance using Plastigage.

New: 0.023 - 0.043 mm wear limit: 0.07 mm

- Do not rotate the crankshaft when measuring the radial play.
- Crankshaft dimensions, refer to **CRANKSHAFT DIMENSIONS**.
- Lock the crankshaft, refer to **CRANKSHAFT, LOCKING**.

5. Thrust Washers

- For bearing 3.
- The side lubricating grooves face outward.

6. Bearing Shell, for the Cylinder Block

- With a lubricating groove.
- Identification for replacement part ordering, refer to **Fig. 16**.
- Do not interchange used bearing shells (mark them).

7. Cylinder Block

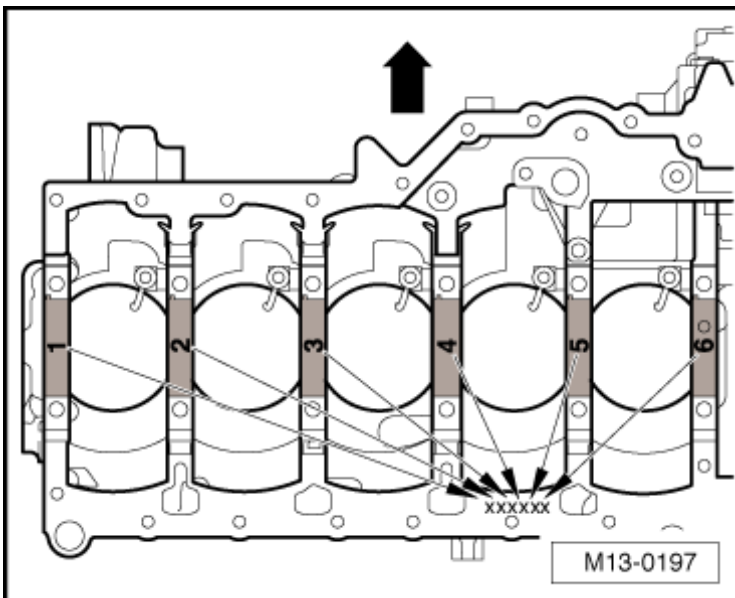


Fig. 16: Identification Of Top Crankshaft Bearing Shells
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

From the factory, the upper bearing shells are allocated to the cylinder block with the correct thickness. Colored

dots serve to identify the bearing thicknesses.

The letters marked on the lower sealing surface of the cylinder block identify which bearing thickness must be installed in which location.

G - Yellow

B - Blue

W - White

NOTE: **The -arrow- points in the direction of travel.**

If the colored dots can no longer be read, use the blue bearing shell.

The lower crankshaft bearing shells are always shipped as a replacement part with the "yellow" colored dot.

CRANKSHAFT, LOCKING

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Crankshaft Adapter T03003
- Locking Pin T40069

Procedure

- Remove the noise insulation. Refer to **Description and Operation** .
- Remove the front part of the right front wheel housing liner. Refer to **Removal and Installation** .
- Install the crankshaft adapter T03003 over the bolts for the vibration damper.

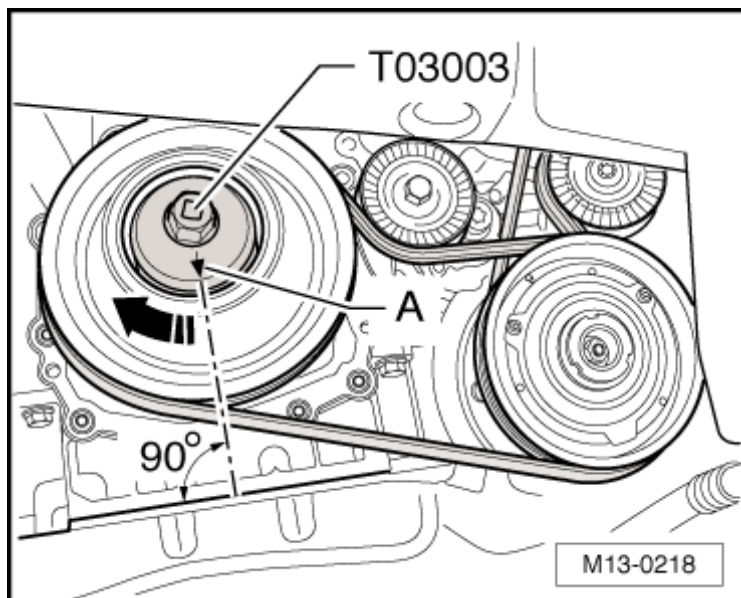


Fig. 17: Identifying Crankshaft Turned Only In Direction Of Engine Rotation
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The crankshaft adapter T03003 can only be installed correctly in one position.

-- Rotate the crankshaft in engine rotation direction -arrow- far enough until the arrow -A- on the crankshaft adapter T03003 points downward vertically, relative to the engine axis.

This position corresponds approximately to the Top Dead Center (TDC) position of the crankshaft for cylinder 5.

NOTE: With the engine removed, the TDC mark can also be seen on the vibration damper and the sealing flange (belt pulley side). The notches -A and B- must align.

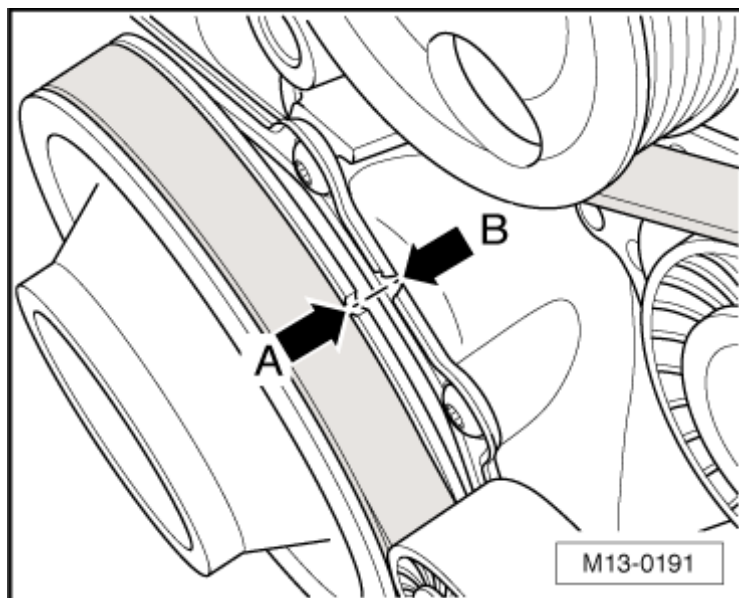


Fig. 18: Identifying Belt Pulley And Sealing Flange At TDC
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the locking bolt -1- from the rear of the cylinder block.

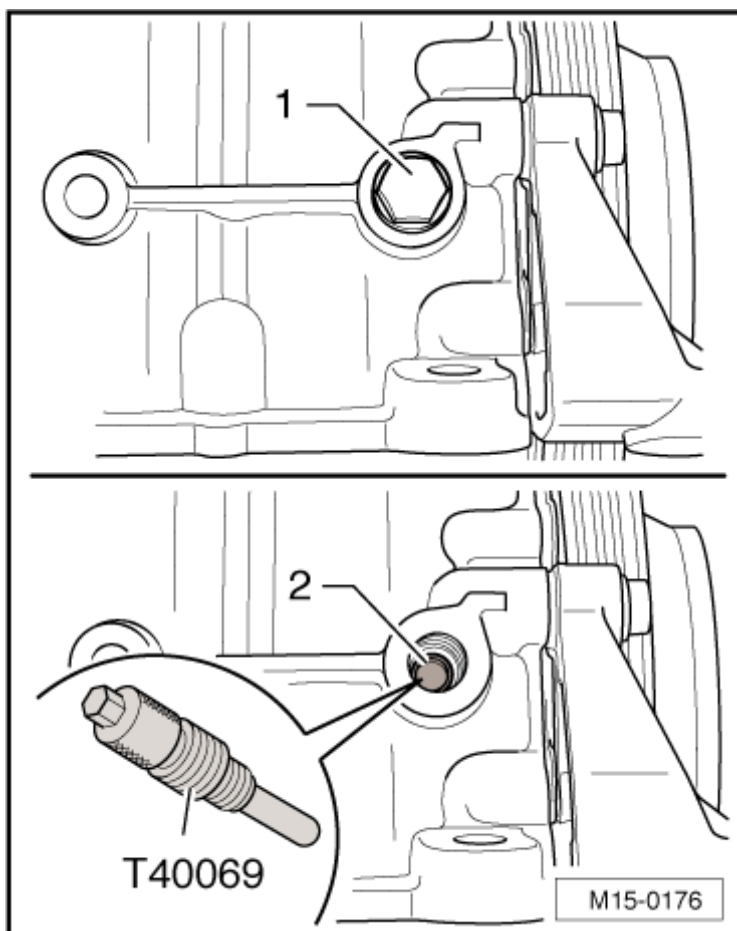


Fig. 19: Identifying Crankshaft Must Not Be Rotated Out Over TDC Marking
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Look through the threaded hole and check whether the bore -2- in the crankshaft aligns with the threaded hole in the block.

Use a mirror to do so, if necessary.

-- Rotate the crankshaft slightly, if necessary.

-- If the hole/bore align, install the locking pin T40069 completely into the threaded hole and tighten it to 10 Nm.

NOTE: With the engine removed, the TDC mark can also be seen on the vibration damper and sealing flange, belt pulley side. Notches -A and B- must align.

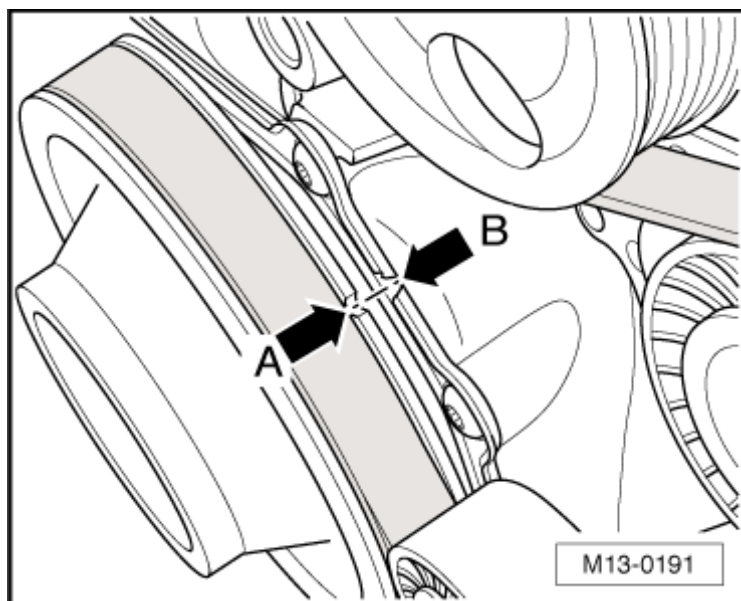


Fig. 20: Identifying Belt Pulley And Sealing Flange At TDC
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Check whether the crankshaft can be rotated.

After Disassembly and Assembly Work:

-- Remove the locking pin T40069 and install the locking bolt -1- to the rear of the cylinder block.

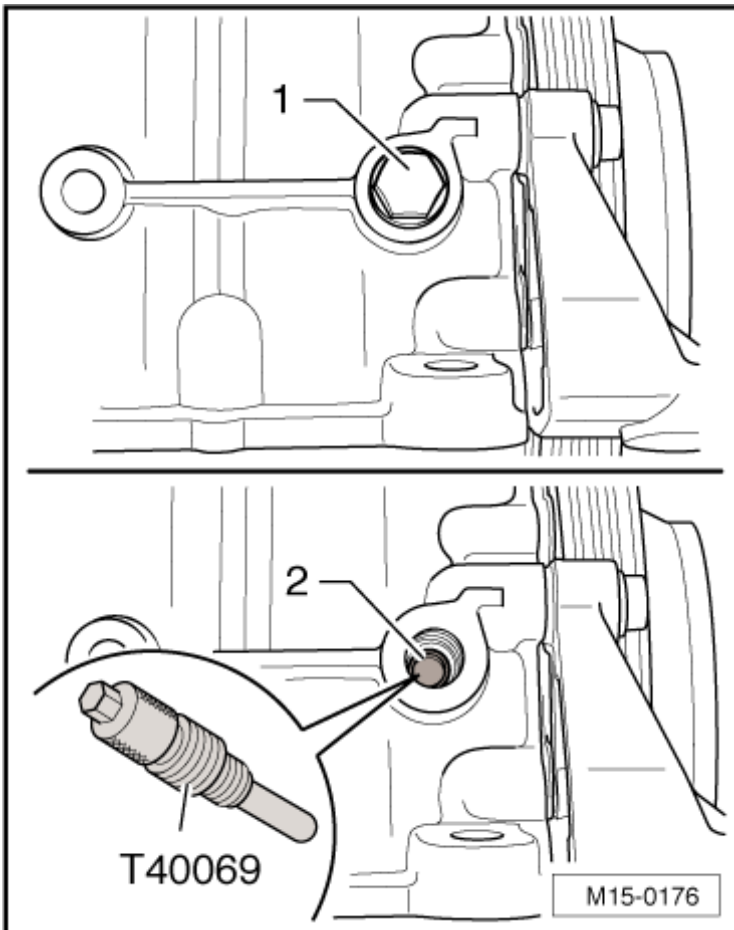


Fig. 21: Identifying Crankshaft Must Not Be Rotated Out Over TDC Marking
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The rest of the installation follows the reverse of the removal procedures.

Tightening Specifications

| Component | Nm |
|--------------------------------|-------|
| Locking bolt to cylinder block | 30 Nm |

TO CHECK/ADJUST VALVE TIMING

- Remove the cylinder head cover. Refer to CYLINDER HEAD COVER .
- Perform the work steps in "Crankshaft, Locking". Refer to CRANKSHAFT, LOCKING.

NOTE: If the threaded holes in the camshafts -arrows- do not align upward, the crankshaft must be rotated one rotation (360°) in engine rotation direction.

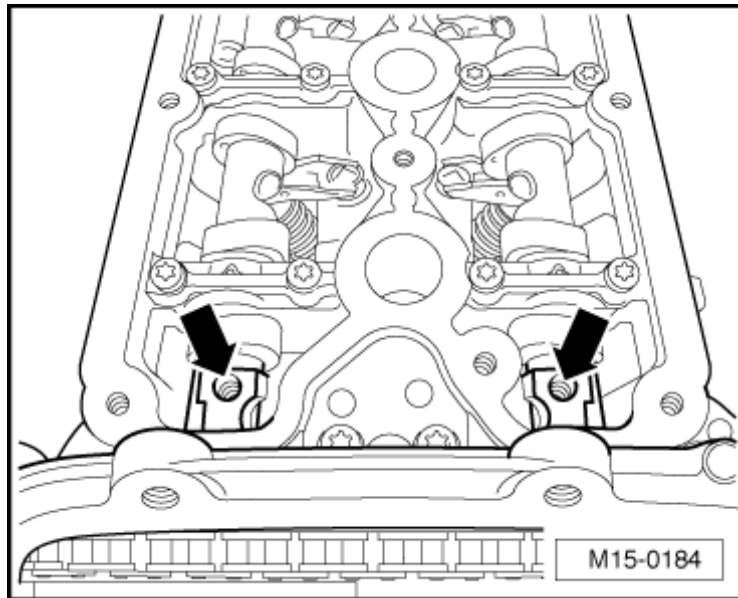


Fig. 22: Identifying Threaded Holes
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

In order to be able to precisely check and adjust the valve timing, always note the following:

- Rotate the crankshaft only in engine rotation direction -arrow-. Do not rotate the crankshaft back, not even slightly!

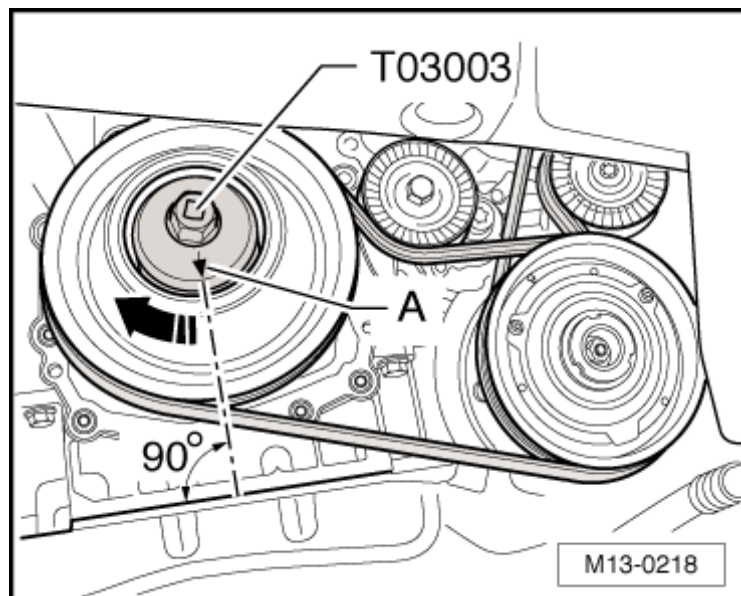


Fig. 23: Identifying Crankshaft Turned Only In Direction Of Engine Rotation
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- The crankshaft must not be rotated past the Top Dead Center (TDC) mark. This means the bore -2- in the crankshaft must not be above the threaded opening in the cylinder block.

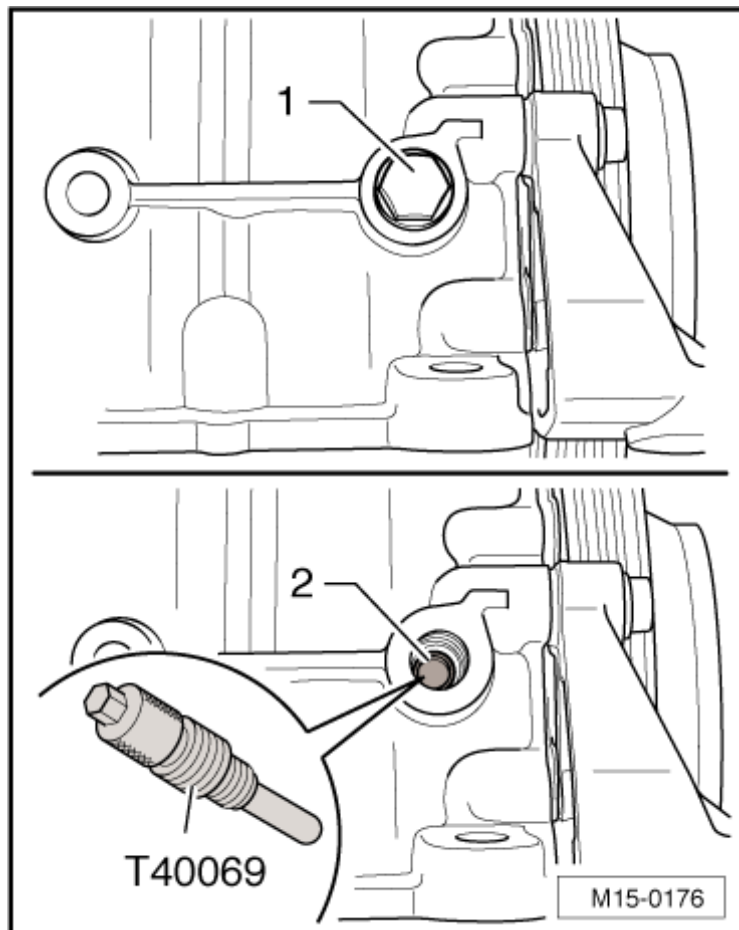


Fig. 24: Identifying Crankshaft Must Not Be Rotated Out Over TDC Marking
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

If the crankshaft was rotated past the TDC mark:

- Rotate the crankshaft back 45° in the opposite direction of engine rotation.
- Then rotate the crankshaft again to the TDC position in engine rotation direction.

When the crankshaft is positioned slightly in front of the TDC position (the bore in the crankshaft is 90% visible), the locking pin T40069 can be installed, although slightly more difficult.

PISTON AND CONNECTING ROD OVERVIEW

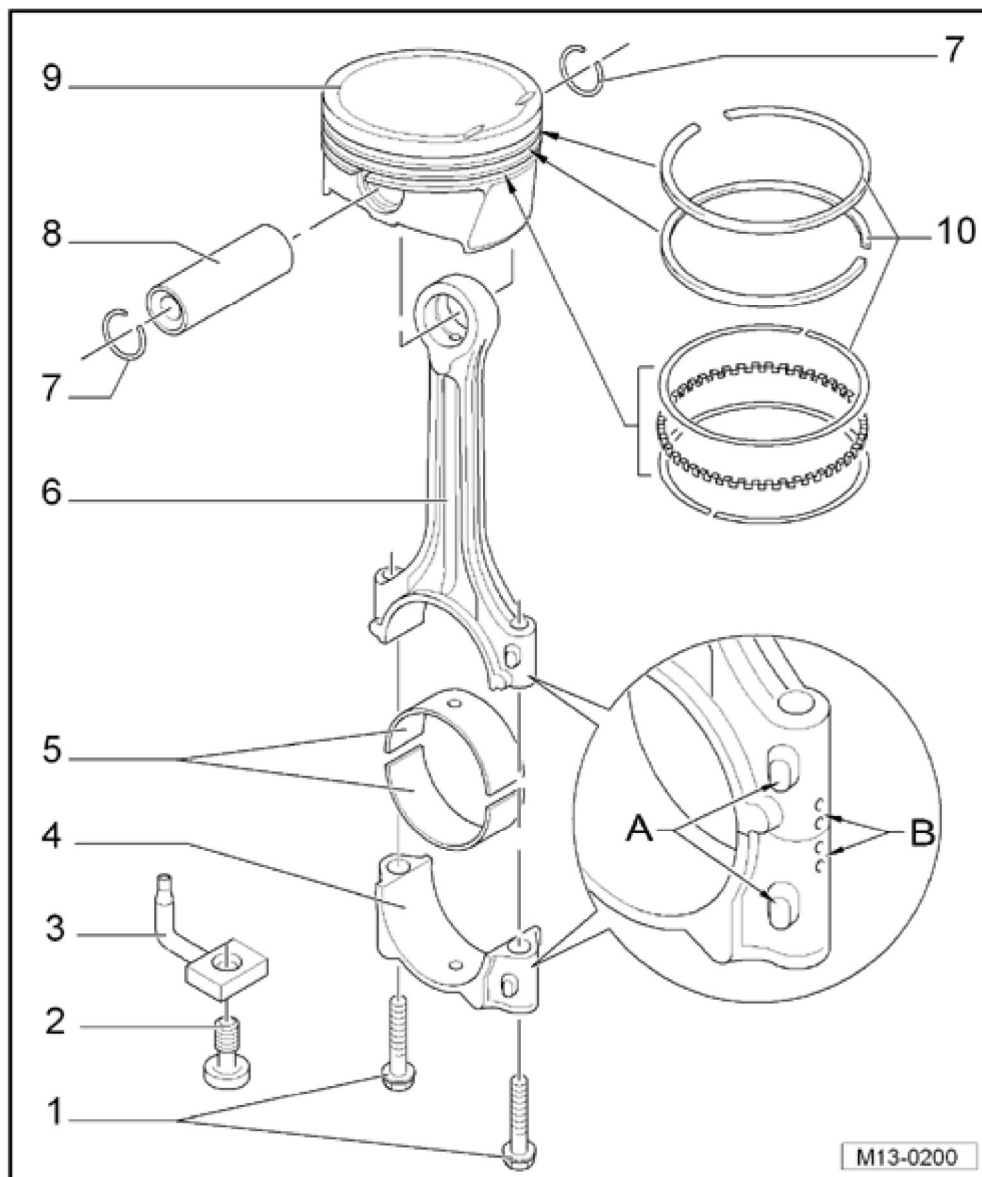


Fig. 25: Identifying Piston And Connecting Rod Assembly Overview
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Bolt

- 30 Nm + 90° (1/4) additional turn.
- Always replace.
- Lubricate the threads and contact surface.
- Tighten to 30 Nm to measure the radial play, do not tighten the additional turn.

2. Pressure Relief Valve

- 27 Nm
- Opening pressure 1.3 to 1.6 bar.

3. Oil Spray Jet

- For the piston cooling.

4. **Connecting Rod Cap**

- Pay attention to the installed position.
- Due to the way the separated connecting rod breaks (cracks), the cap fits only in one position and only onto the respective connecting rod.
- Affiliation to the cylinder mark -B-.
- Installed position: The marks -A- point to belt pulley side.

5. **Bearing Shell**

- Note the installed position, refer to **Fig. 26**.
- Do not interchange used bearing shells (mark them).
- Axial play new: 0.10 to 0.35 mm.

Wear limit: 0.4 mm.

- Measure the radial clearance using Plastigage:

New: 0.02 to 0.06 mm.

Wear limit: 0.09 mm.

Do not rotate the crankshaft when measuring the radial play.

6. **Connecting Rod**

- With a cracked bearing cap.
- Separating a new connecting rod. refer to **NEW CONNECTING ROD, SEPARATING**.
- Only replace as a set.
- Affiliation to the cylinder mark -B-.
- Installed position: The marks -A- point to belt pulley side.

7. **Circlip**

8. **Piston Pin**

- If difficult to move, heat the piston to 60 °C (140 °F).
- Remove and install using a pilot drift VW 222 A.

9. **Piston**

- Checking, refer to **Fig. 29**.
- Mark the installed position and the cylinder allocation.
- The arrow on the piston face points toward the belt pulley side.
- Install using a piston ring compressor.
- Cylinder bore, checking. Refer to **Fig. 30**.
- For the correct piston and cylinder dimensions, refer to **PISTON AND CYLINDER DIMENSIONS**.

10. Piston Rings

- Offset gaps by 120°
- Use piston ring pliers for removal and installation.
- Marks face toward the piston crown.
- Ring gap, checking. Refer to **Fig. 27**.
- Piston ring groove clearance, checking. Refer to **Fig. 28**.

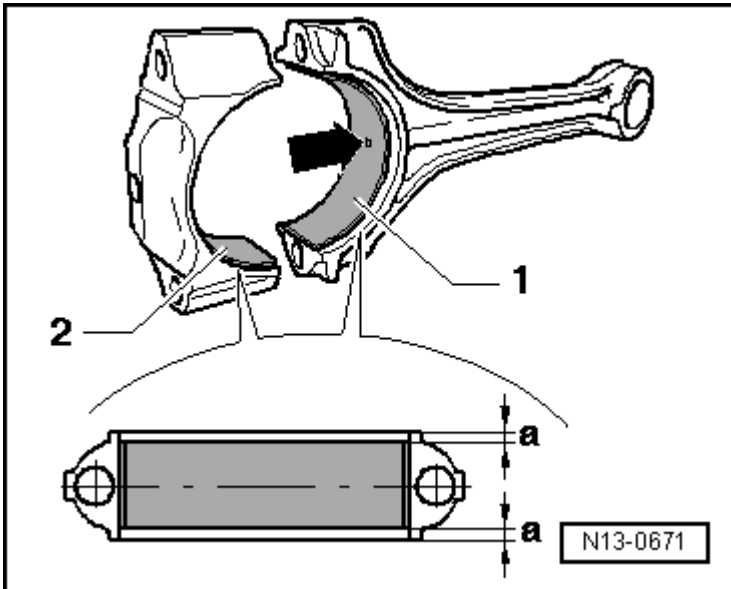


Fig. 26: Identifying Bearing Shells - Installed Positions

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The bearing shell -1- with a oil bore -arrow- is for the connecting rod.

The bearing shell -2- without a oil bore is for the connecting rod cap.

-- Place the bearing shells centrally into the connecting rod and cap.

Dimension -a- must be the same on the left and right sides.

SPECIFICATIONS

CRANKSHAFT DIMENSIONS

(Dimensions are in mm)

| Honing Dimension | Crankshaft Bearing Pin Diameter | | Connecting Rod Bearing Pin Diameter | |
|------------------|---------------------------------|---------------|-------------------------------------|---------------|
| Basic dimension | 58.00 | -0.022 -0.042 | 47.80 | -0.022 -0.042 |
| 1st oversize | 57.75 | -0.022 -0.042 | 47.55 | -0.022 -0.042 |

2013 Volkswagen Jetta SE

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| | | | | |
|--------------|-------|---------------|-------|---------------|
| 2nd oversize | 57.50 | -0.022 -0.042 | 47.30 | -0.022 -0.042 |
| Stage III | 57.25 | -0.022 -0.042 | 47.05 | -0.022 -0.042 |

PISTON AND CYLINDER DIMENSIONS

| Honing Dimension | Piston Diameter | Cylinder Bore Diameter |
|---|-----------------------|------------------------|
| Basic dimension mm | 82.465 ⁽¹⁾ | 82.51 |
| (1) Measurement does not include the graphite coating (thickness = 0.02 mm). The coating wears off. | | |

FASTENER TIGHTENING SPECIFICATIONS

| Component | Fastener Size | Nm |
|--|---------------|----------|
| Accessory Bracket to Cylinder Block Bolt | - | 25 |
| Air Conditioning Compressor Ribbed Belt, Idler Pulley with Bracket to Accessory Bracket Bolt | - | 25 |
| Air Conditioning Compressor to Accessory Bracket Bolt | - | 25 |
| Air Conditioning Compressor Ribbed Belt, Belt Tensioner to Accessory Bracket Bolt | - | 35 |
| Brake Booster Vacuum Pump to Control Housing Cover Bolt | - | 10 |
| Connecting Rod Bearing Cap to Connecting Rod Bolt ⁽¹⁾ | - | 30 + 90° |
| Control Housing Cover to Cylinder Block Bolt | - | 25 |
| Coolant Pump to Cylinder Block Bolt | - | 10 |
| Cover to Cylinder Block Bolt | - | 10 |
| Crankshaft Bearing Cap to Cylinder Block Bolt ⁽¹⁾ | - | 40 + 90° |
| Double Sprocket to Cylinder Block Bolt ⁽¹⁾ | - | 60 + 90° |
| Drive Plate/Flywheel to Crankshaft Bolt ⁽¹⁾ | - | 60 + 90° |
| Engine Mount to Accessory Bracket Bolt ⁽¹⁾ | - | 40 + 90° |
| Engine Speed Sensor to Control Housing Cover Bolt | - | 5 |
| Exhaust Camshaft Sprocket to Camshaft Bolt ⁽¹⁾ | - | 60 + 90° |
| Generator to Accessory Bracket Bolt | - | 25 |
| Generator and Coolant Pump Ribbed Belt, Idler Pulley with Bracket to Accessory Bracket Bolt | - | 8 |
| Generator and Coolant Pump Ribbed Belt, Belt Tensioner to Accessory Bracket Bolt | - | 35 |
| Intake Camshaft Adjuster to Camshaft Bolt ⁽¹⁾ | - | 60 + 90° |
| Intake Manifold Support to Cylinder Block Bolt | - | 25 |
| Knock Sensor to Cylinder Block Bolt ⁽²⁾ | - | 20 |
| Locking Bolt to Cylinder Block Bolt | - | 30 |

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| | | |
|---|---|----------|
| Mount to Cylinder Block Bolt | - | 10 |
| Oil Dipstick Guide Tube to Cylinder Block Bolt | - | 25 |
| Oil Filter Bracket to Cylinder Block Bolt | - | 25 |
| Oil Pump Sprocket to Oil Pump Bolt ⁽¹⁾ | - | 20 + 90° |
| Pressure Relief Valve | - | 27 |
| Sealing Flange to Cylinder Block Bolt | - | 10 |
| Thermostat Housing with Coolant Pipe to Cylinder Block Bolt | - | 10 |
| Threaded Pin to Cylinder Block | - | 40 |
| Timing Chain Tensioner to Cylinder Block Bolt | - | 10 |
| Timing Chain Tensioner to Cylinder Head Bolt | - | 10 |
| Transport Strap to Cylinder Block Bolt | - | 25 |
| Vibration Damper to Crankshaft Bolt ⁽¹⁾ | - | 50 + 90° |

(1) Always replace

(2) Tightening specifications affects the function of the knock sensor

DIAGNOSIS AND TESTING

PISTON, RINGS AND CYLINDER BORE, CHECKING

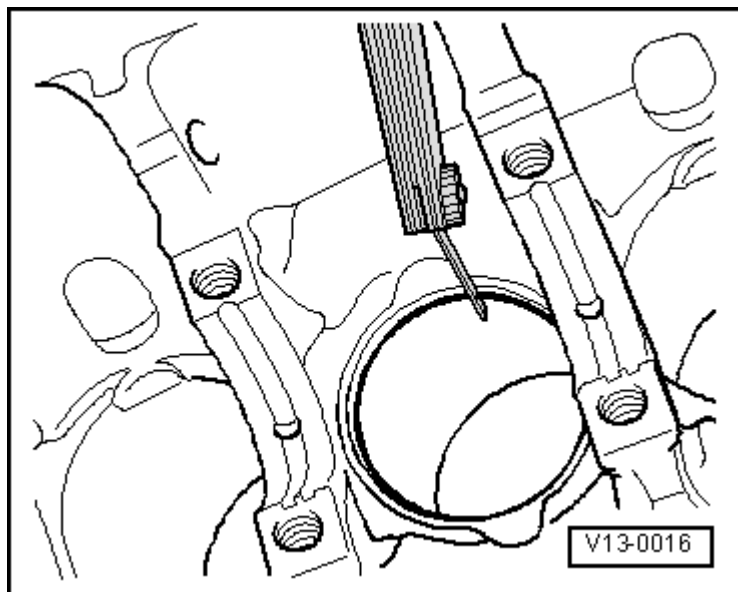


Fig. 27: Identifying Check Of Piston Ring Gap
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Feeler Gauge

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-- Insert the piston ring into the lower cylinder opening at a right angle from above approximately 15 mm from the cylinder edge.

To do this use a piston without piston rings.

| Piston Ring | | Gap | |
|-------------------|----|-------------|------------|
| | | New | Wear limit |
| Compression rings | mm | 0.20•••0.40 | 0.8 |
| Oil scraping ring | mm | 0.25•••0.50 | 0.8 |

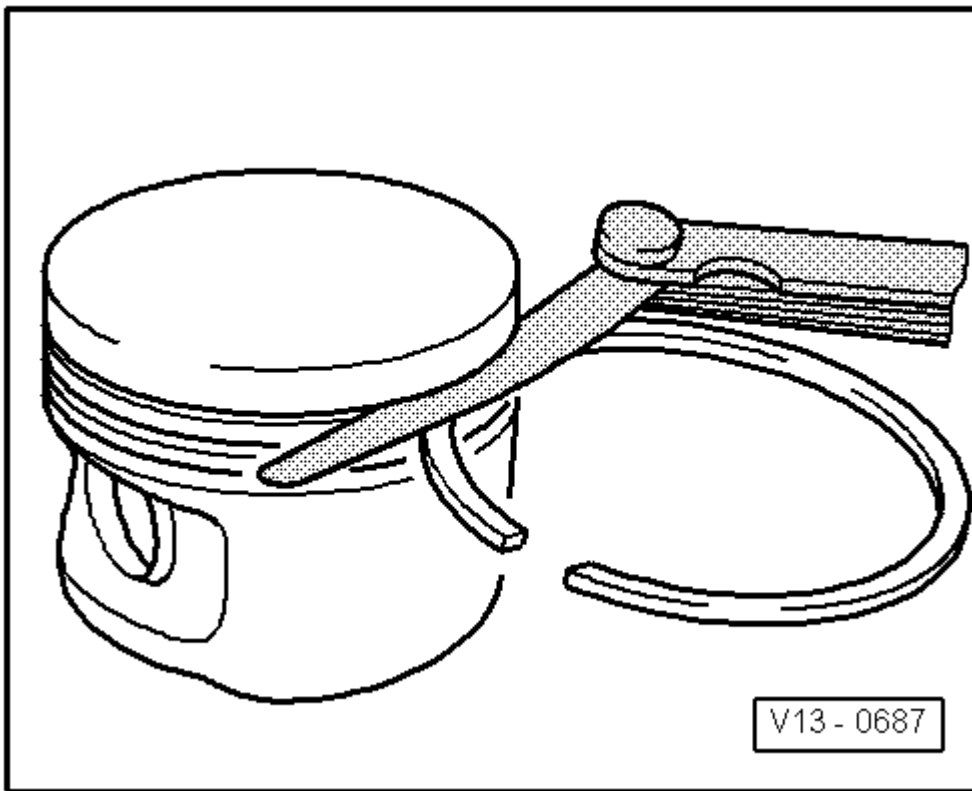


Fig. 28: Identifying Check Of Piston Ring Gap
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Feeler Gauge

-- Clean the groove for the ring before checking.

| Piston Ring | | Ring to Groove Clearance | |
|-------------------|----|--------------------------|------------|
| | | New | Wear limit |
| Compression rings | mm | 0.06•••0.09 | 0.20 |

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ENGINE 2.5 Liter - Crankshaft, Cylinder Block - Engine Code(s): CBTA & CBUA

| | | | |
|-------------------|----|-------------|------|
| Oil scraping ring | mm | 0.03...0.06 | 0.15 |
|-------------------|----|-------------|------|

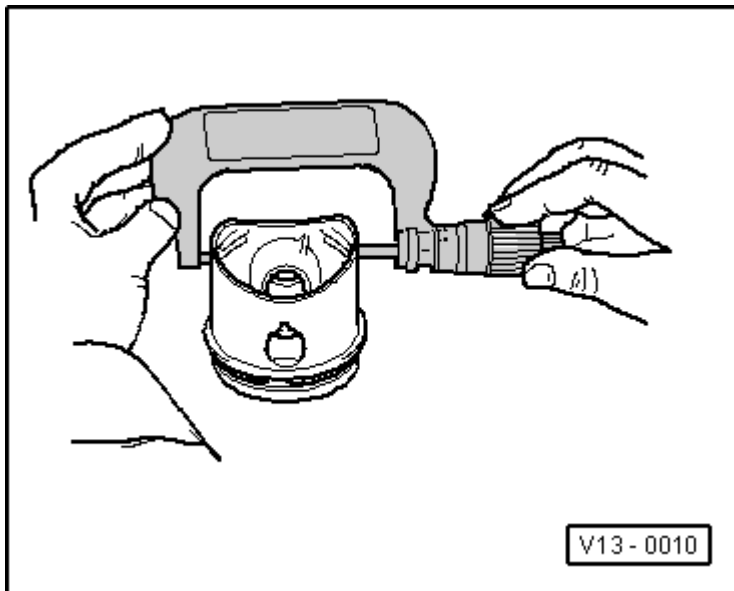


Fig. 29: Checking Piston

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- External Micrometer 75 to 100 mm

-- Measure approximately 10 mm from the lower edge of the piston skirt and offset 90° to the piston axis.

Deviation from nominal dimension: Max. 0.04 mm

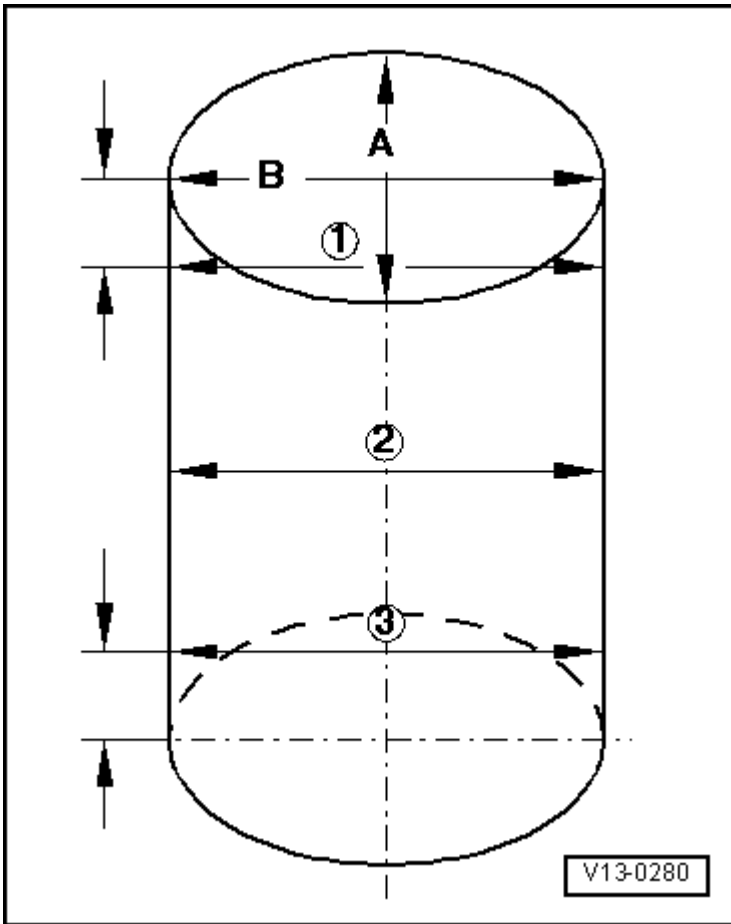


Fig. 30: Identifying Check Of Cylinder Bores

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Internal Dial Gauge 50 to 100 mm

-- Measure diagonally at 3 positions transversely -A- and longitudinally -B-.

Deviation from nominal size: Max. 0.08 mm.

NOTE: The cylinder bore must not be measured if the cylinder block is secured to engine stand using the engine lateral bracket T03001, or else results may be incorrect.

REMOVAL AND INSTALLATION

RIBBED BELT

Special tools and workshop equipment required

- Locking Pin T10060 A

Removing

- Remove the noise insulation. Refer to Description and Operation .
- Remove the front part of the right front wheel housing liner. Refer to Removal and Installation .

Air Conditioning (A/C) Compressor Ribbed Belt:

CAUTION: Risk of destroying due to a reversed running direction of a used ribbed belt.

- Before removing the ribbed belt, mark the running direction with chalk or a felt-tip pen for reinstallation later.

- Rotate the belt tensioner -1- as shown using a 15 mm box end wrench -A- in the -direction of the arrow- and secure it using the locking pin T10060 A.

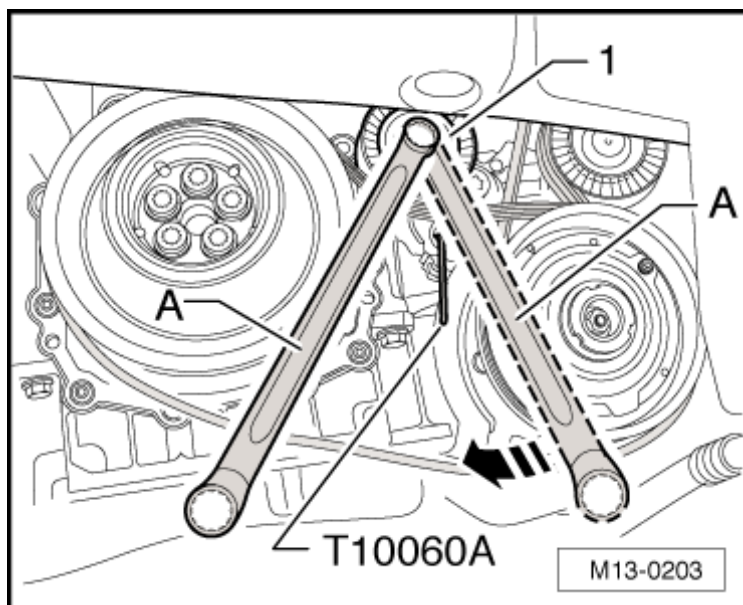


Fig. 31: Identifying Rotation Of Tensioner Secured In Position With Locking Pin T10060A
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the A/C compressor ribbed belt.

Generator and Coolant Pump Ribbed Belt:

CAUTION: Risk of destroying due to a reversed running direction of a used ribbed belt.

- **Before removing the ribbed belt, mark the running direction with chalk or a felt-tip pen for reinstallation later.**

- Relieve tension on the tensioner -1- for the A/C compressor ribbed belt (remove the locking pin T10060 A).
- Install the locking pin T10060 A into the tensioner -2-.

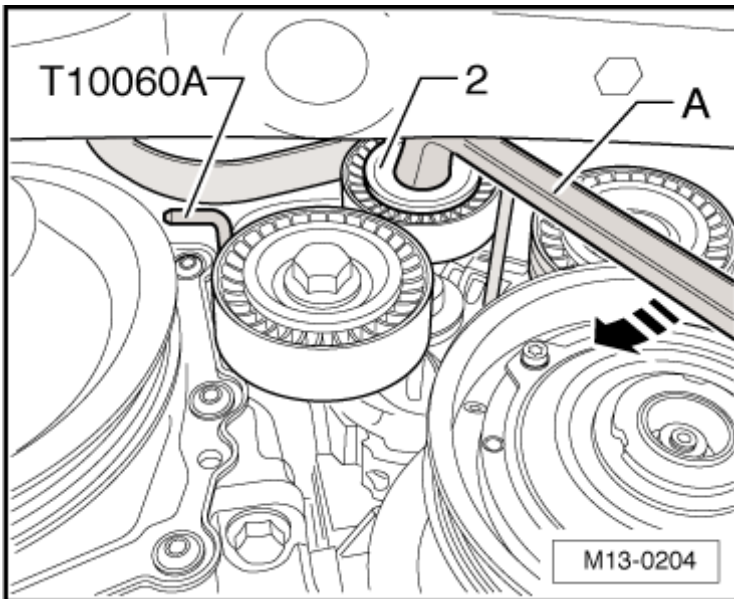


Fig. 32: Identifying Locking Pin Inserted T10060A Into Tensioning Element
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Rotate the tensioner -2- using a 15 mm box end wrench -A- in the -direction of the arrow- and secure it using the locking pin T10060 A.
- Remove the generator and coolant pump ribbed belt.

Installing

Install in reverse order of removal. Note the following:

- Place the generator and coolant pump ribbed belt onto the pulleys, then lastly onto the idler pulley -3-.

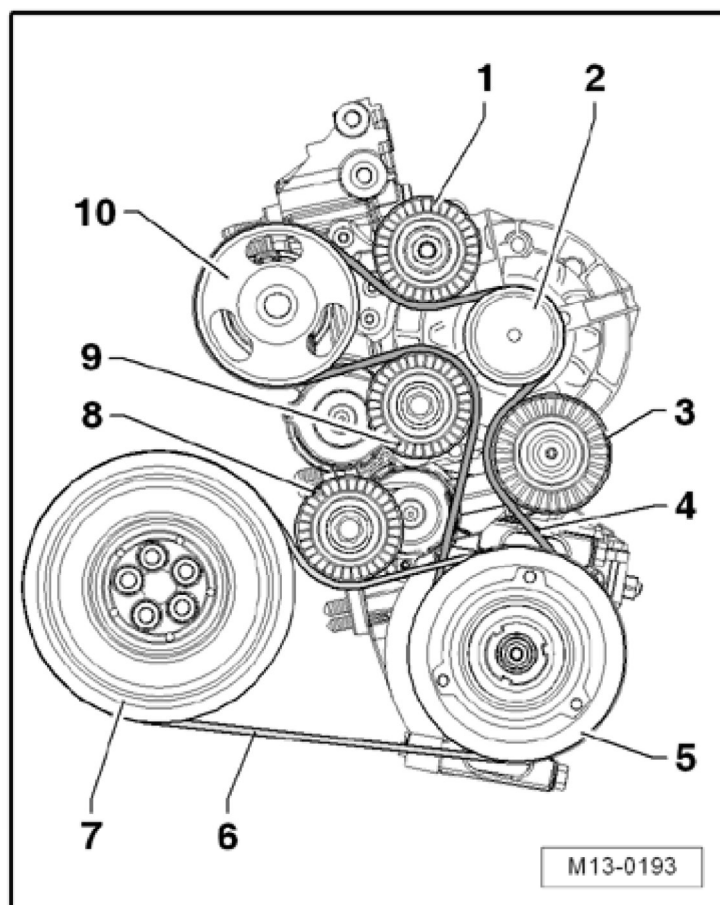


Fig. 33: Identifying Ribbed Belt Routing 2.5L 5-Cylinder Gasoline Engine
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Before tensioning the generator and coolant pump ribbed belt, rotate the compressor pulley and check the ribbed belt for correct seating on the pulley.

-- Before installing A/C compressor ribbed belt, secure the tensioner using the locking pin T10060 A.

NOTE: When installing the ribbed belt, note the direction of rotation of the belt and be sure that it is seated correctly on the pulley.

-- Start the engine and check the belt running.

BRAKE BOOSTER VACUUM PUMP

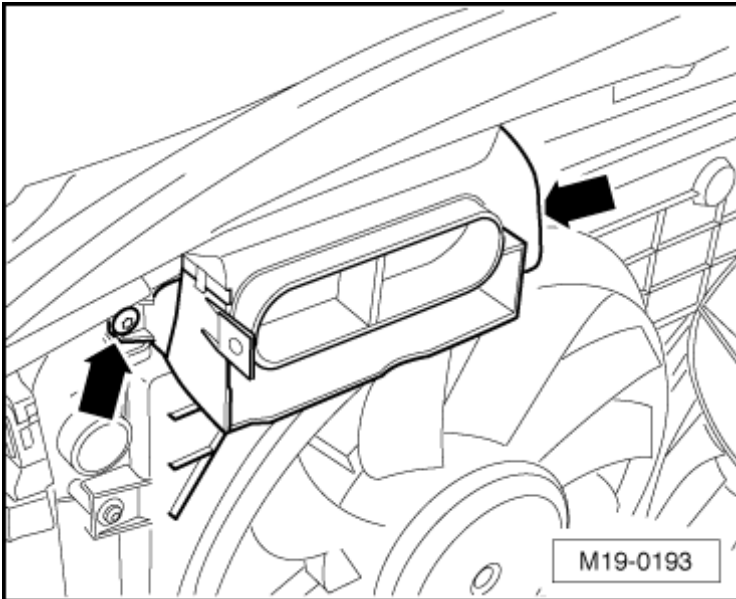
Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331

NOTE: Due to installation conditions, the transmission must be removed on vehicles with a automatic transmission.

Removing

- Remove the engine cover with air filter. Refer to **ENGINE COVER WITH AIR FILTER** .
- Remove the battery and the battery tray. Refer to **Removal and Installation** .
- Remove the intake air guide bolts -arrows- from the lock carrier.

**Fig. 34: Identifying Air Guide On Lock Carrier**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the connecting pipe -4-. To do so, disconnect the vent hose -1- from the oil filter bracket, and if present the vent hose -2- from the Secondary Air Injection (AIR) pump motor (compress the securing ring) and remove the spring clamp -3-.

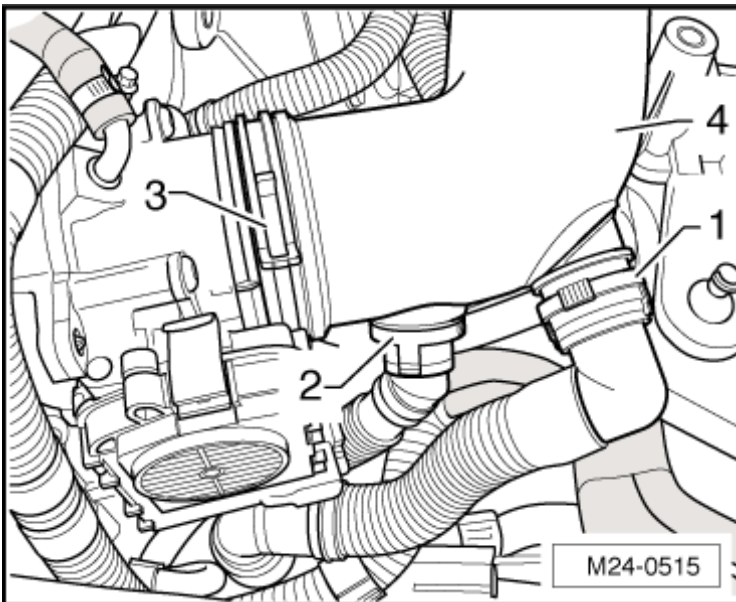


Fig. 35: Identifying Air Hoses And Are Fitted Securely
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Unclip the wiring harness from the bracket -2-.

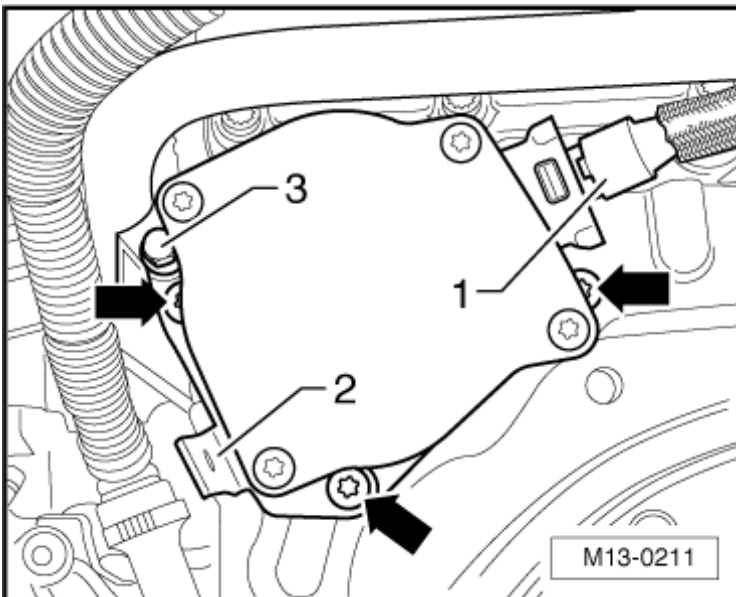


Fig. 36: Locating 3 Bolts And Vacuum Pump
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the bolt -3- for the coolant pipe.
- Disconnect the vacuum hose -1-.
- Remove the 3 bolts -arrows- and remove the vacuum pump.

NOTE: The 4 cover bolts must NOT be loosened under any circumstances!

-- Remove the old gasket.

Installing

-- Place a new gasket -2- onto the vacuum pump.

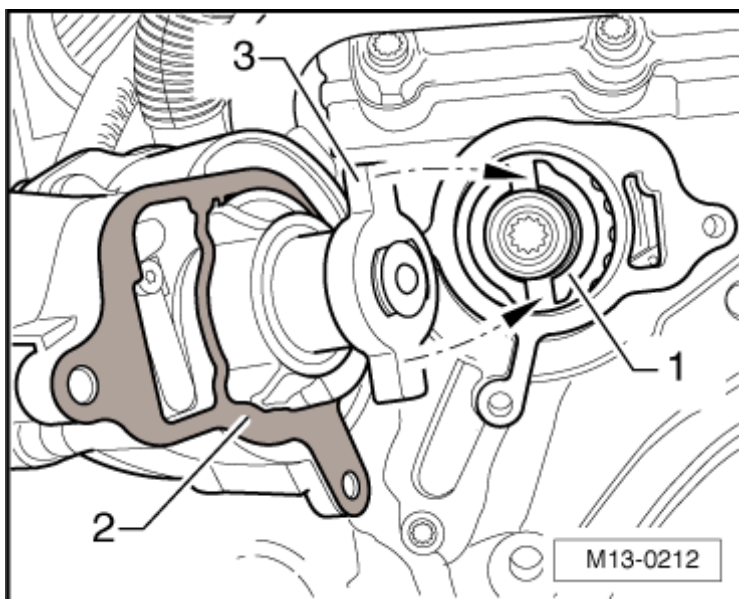


Fig. 37: Identifying New Gasket On Placed On Vacuum Pump
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Place the vacuum pump coupling plate -3- so that it engages into the symmetrical groove of the double sprocket -1- -arrows- when installing the vacuum pump.

-- Tighten the bolts.

The rest of the installation follows the reverse of the removal procedure.

-- Install the battery tray and battery. Refer to **Removal and Installation** .

Tightening Specifications

| Component | Nm |
|--------------------------------------|----|
| Vacuum pump to control housing cover | 10 |
| Coolant pipe to bracket | 10 |

SEALING FLANGE, BELT PULLEY SIDE

Special tools and workshop equipment required

- Trim Removal Wedge 3409
- Oil Seal Guide Sleeve T03004
- Hand Drill with Plastic Brush Attachment
- Protective Eyewear
- Silicone Sealant D 174 003 A2

Removing

-- Remove the Air Conditioning (A/C) compressor, refer to one of the following:

- Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10. Refer to **RIBBED BELT**.

-- Lock the crankshaft. Refer to **CRANKSHAFT, LOCKING**.

-- Remove the vibration damper from the crankshaft.

-- Remove the tensioner -1-.

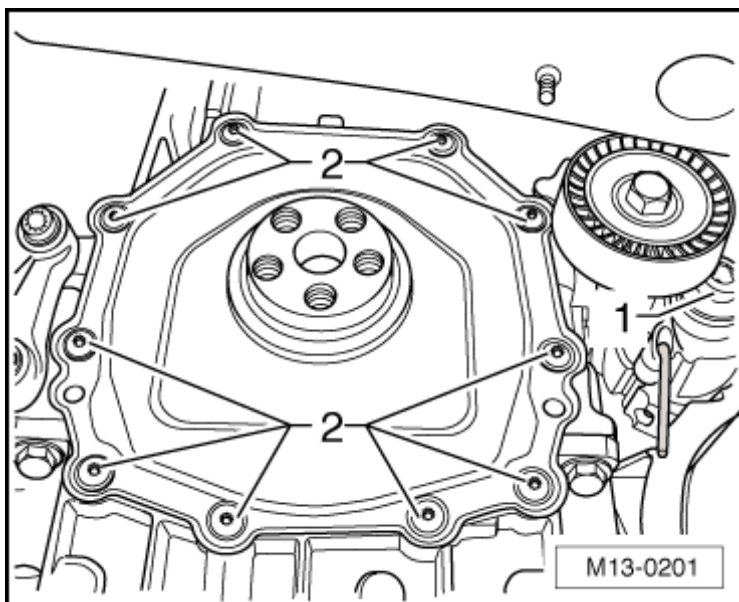


Fig. 38: Identifying Tensioning Element & Bolts

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the sealing flange bolts -2-.

-- Begin at the alignment bushings -arrows- and pry off the sealing flange -1- using a suitable screwdriver -A-.

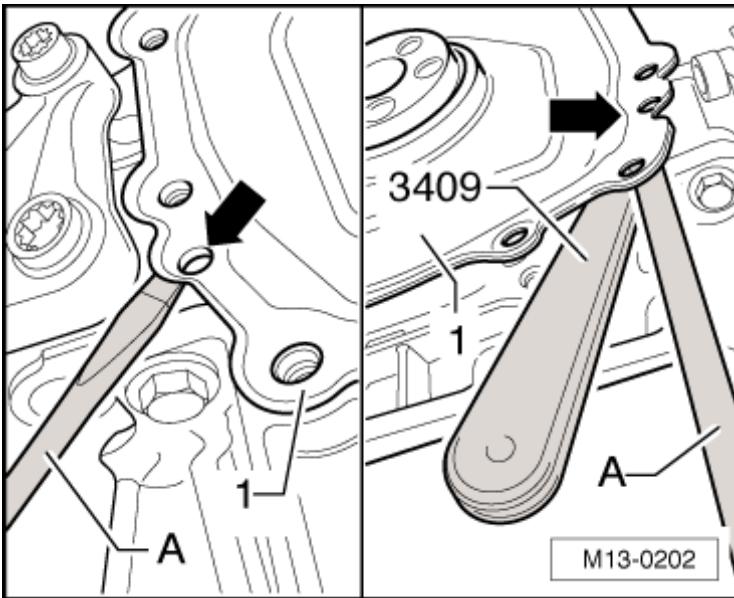


Fig. 39: Identifying Screwdriver And Trim Removal Wedge 3409 To Press Off Sealing Flange
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Use the trim removal wedge 3409 to support the screwdriver in order to prevent damage to the sealing flange of cylinder block.

The sealing flange is damaged while removing.

-- Pry off the sealing flange completely.

NOTE: After removing the sealing flange, clean the trim removal wedge 3409 which is intended for the removal of the interior equipment parts.

Installing

WARNING: To prevent injuries from shavings, wear protective goggles and protective clothing.

-- Remove the remainder of the sealant from the cylinder block, for example, using a rotating plastic brush.

CAUTION: Make sure that no sealant residue enters the engine.

-- Clean the sealing surface of the cylinder block and crankshaft journals; they must be free of oil and grease.

NOTE: Do not additionally lubricate or grease the sealing lip of the sealing flange!

The following steps must be followed so that the sealing lip of the sealing

flange does not roll itself up when installing.

-- Widen the sealing lip of the new sealing flange seal as shown using the oil seal guide sleeve T03004.

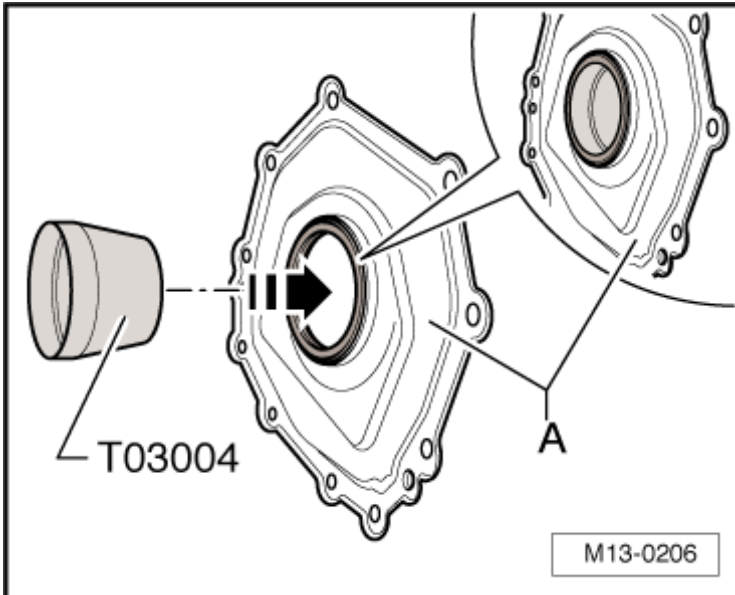


Fig. 40: Identifying Sealing Lip Of New Sealing Flange Widened Using Assembly Sleeve T03004
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The surface -A- is the outer side.

-- After a short time, remove the oil seal guide sleeve T03004 and slide it rotated 180° into the seal.

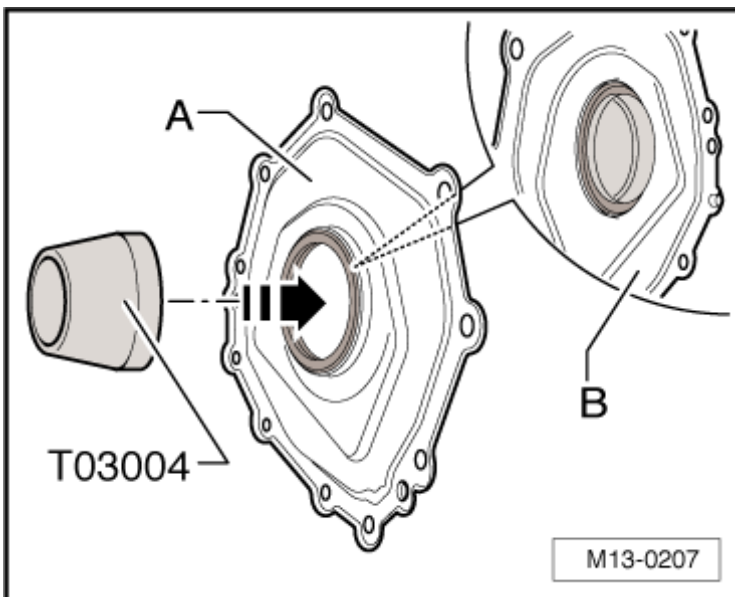


Fig. 41: Identifying Sliding Assembly Sleeve T03004 Into Sealing Ring
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The oil seal guide sleeve T03004 must stand out approximately 3 mm on the inner side -B-. The surface -A- is the outer side. The surface -B- is the inner side (sealing surface).

-- Cut the sealant tube nozzle at the front mark (nozzle diameter: approximately 2 mm).

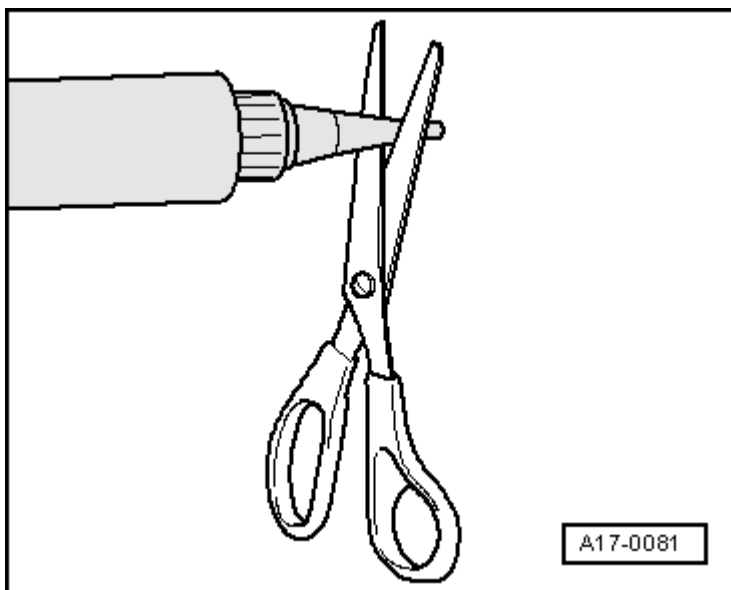


Fig. 42: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 Mm)
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The sealing flange must be installed within 5 minutes after application of sealant.

-- Apply a sealant bead -A- as shown into the groove of the sealing flange.

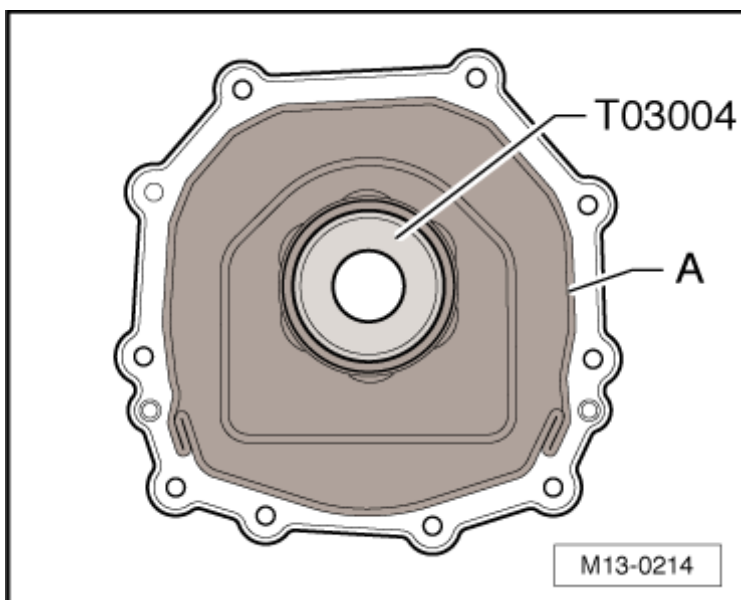


Fig. 43: Identifying Sealant Bead Applied Into Groove Of Sealing Flange

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Width of the sealant bead: 2.5 to 3.0 mm
- Height of the sealant bead above the sealing surface: approximately 1.0 mm

-- Install the sealing flange using the oil seal guide sleeve T03004 onto the crankshaft journal and press uniformly onto the cylinder block.

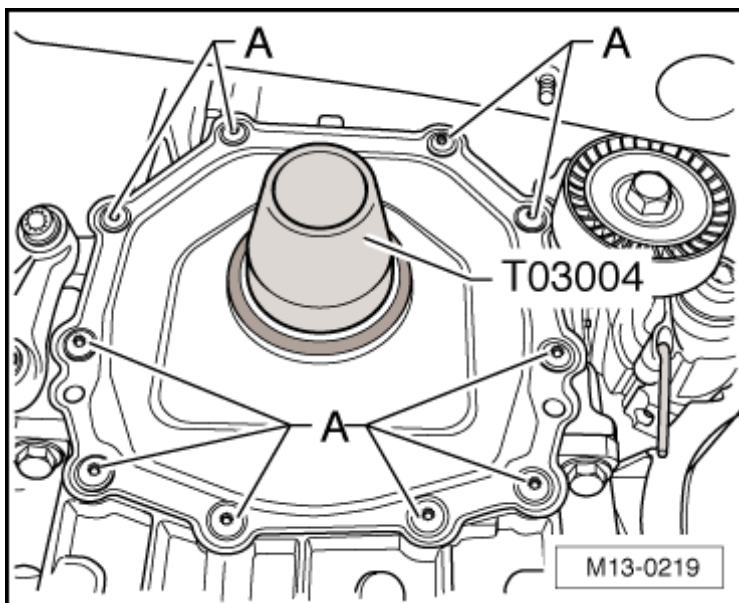


Fig. 44: Identifying Sealing Flange Inserted Using Assembly Sleeve T03004 On Crankshaft Journals And Pressed Uniformly On Cylinder Block

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten the bolts -A- uniformly in a diagonal sequence.

The rest of the installation follows the reverse of the removal procedures. When doing this note the following:

- Remove locking pin T40069 from the rear of the cylinder block and install the locking bolt.

Tightening Specifications

| Component | Nm |
|---|-----------------------------------|
| Vibration damper to crankshaft ⁽¹⁾ | 50 Nm + 90° (1/4) additional turn |
| Belt tensioner to accessory bracket | 35 |
| Sealing flange to cylinder block | 10 |
| Locking bolt to cylinder block | 30 |
| (1) Always replace | |

CONTROL HOUSING COVER

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Torque Wrench (40-200 Nm) V.A.G 1332
- Hand Drill with Plastic Brush Attachment
- Protective Eyewear
- Silicone Sealant D 174 003 A2

Removing

- Engine removed, transmission is disconnected from the flange.
- Remove the chain compartment cover. Refer to **CHAIN COMPARTMENT COVER** .
- Remove the flywheel or drive plate and remove the sensor wheel for the engine speed sensor -G28- from the crankshaft.
- Remove the cylinder head. Refer to **CYLINDER HEAD** .
- Disengage the wiring harness -arrow- and remove the engine speed sensor -1- and vacuum pump -2-.

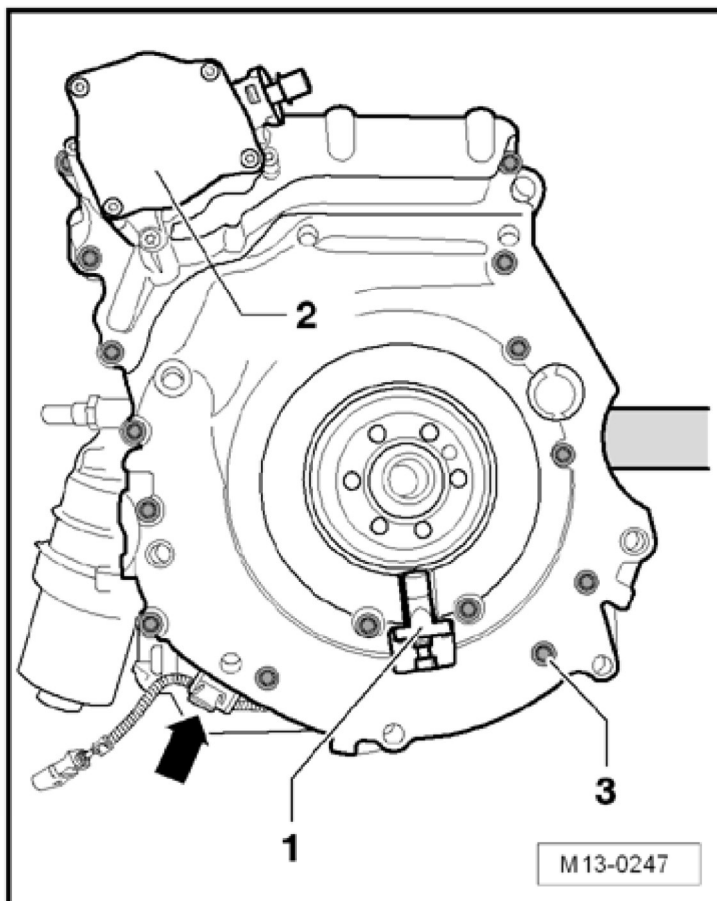


Fig. 45: Identifying Removal Points For Control Housing Cover -1- From Cylinder Block -2- And From Upper Oil Pan -3-

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the bolts -3-.

-- Pry off the control housing cover -1- from the cylinder block -2- and from the upper oil pan -3- at the positions designated at the top and bottom using a suitable screwdriver -A-.

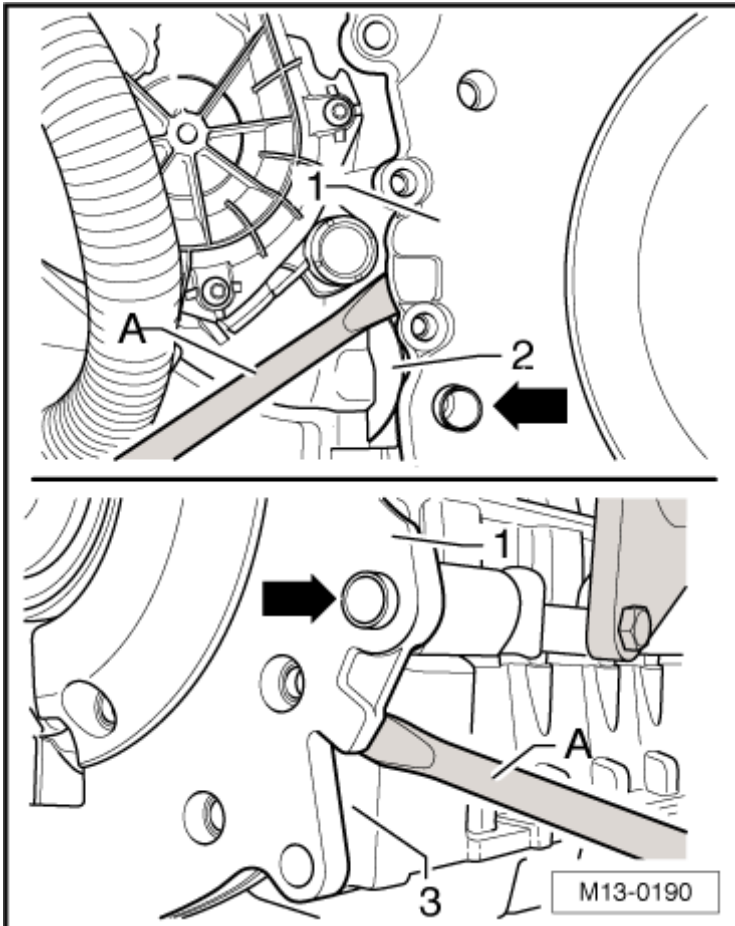


Fig. 46: Identifying Screwdriver And Removal Positions For Control Housing Cover From Cylinder Block Or From Upper Section Of Oil Pan

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Start in the area of the alignment sleeves -arrows-.

NOTE: Make sure the sealing surfaces are not damaged.

-- Drive out the seal with the control housing cover removed.

Installing

WARNING: To prevent injuries from shavings, wear protective goggles and protective clothing.

-- Remove the remainder of the sealant from the cylinder block, upper oil pan and control housing cover, for example using a rotating plastic brush.

CAUTION: Make sure that no sealant residue enters the engine.

-- Clean the sealing surfaces of the cylinder block, upper oil pan and control housing cover, they must be free of oil and grease.

-- Replace the seals -1 and 2-

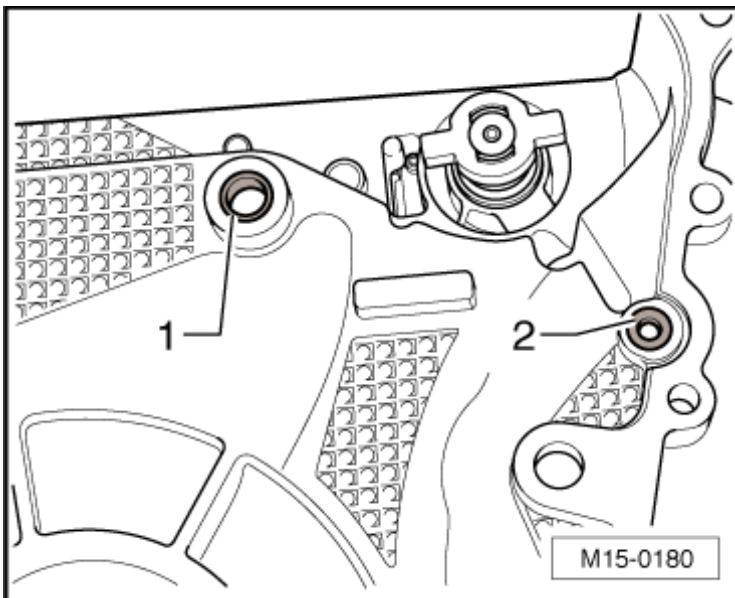


Fig. 47: Identifying Sealing Rings

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Cut the sealant tube nozzle at the front mark (nozzle diameter: approximately 1 mm).

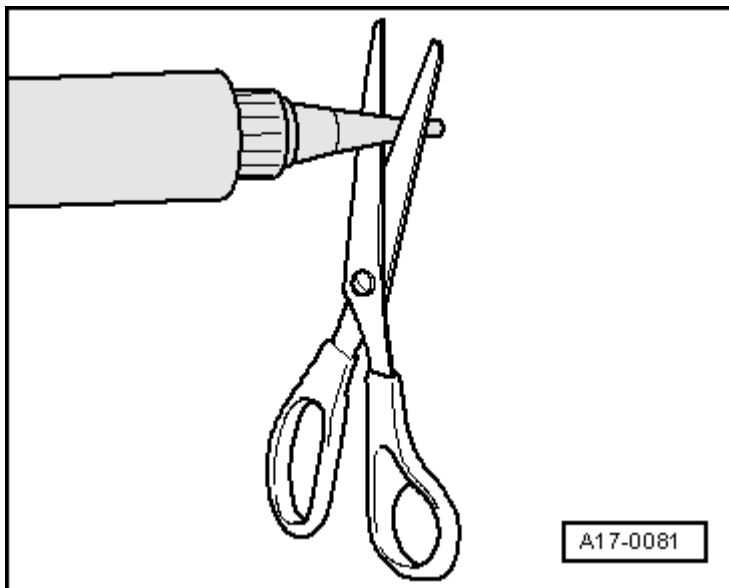


Fig. 48: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 3 Mm)
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: **The control housing cover must be installed within 5 minutes after application of the sealant.**

-- Apply the sealant bead -A- onto the control housing cover as shown.

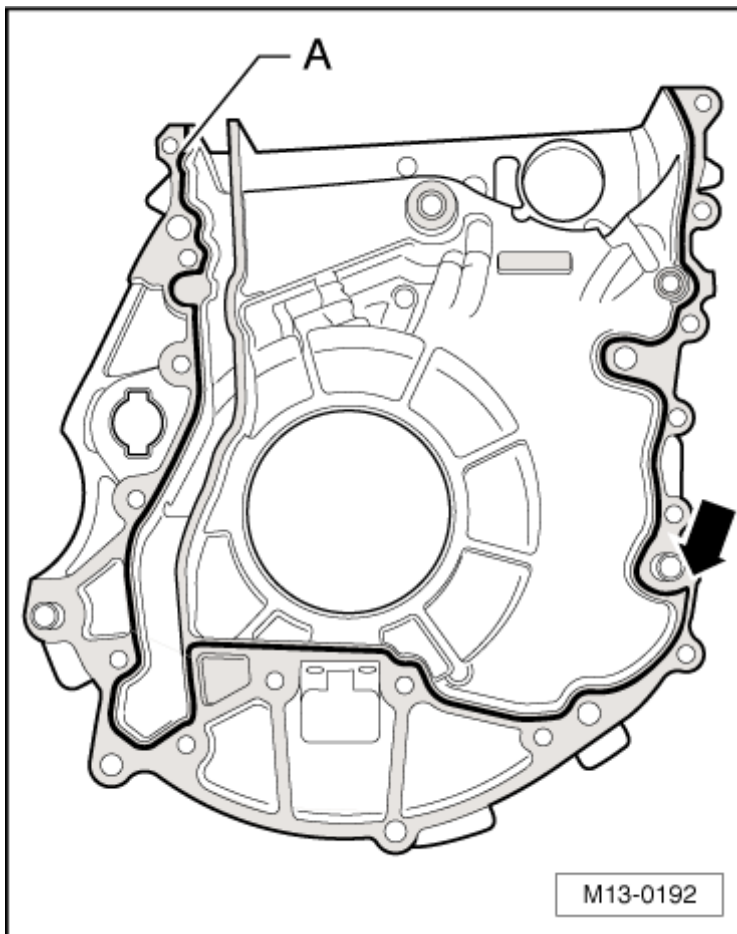


Fig. 49: Identifying Sealant Bead To Apply On Control Housing Cover
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- The sealant bead must be 1.5 to 2.0 mm thick.
- Pay special attention to the course of the sealant bead in the area -arrow-.

-- Install the control housing cover so that the alignment sleeves engage in the bores in the cylinder block.

-- Install all bolts hand tight.

-- First, tighten all the bolts -3- to the cylinder block and the upper oil pan to 10 Nm.

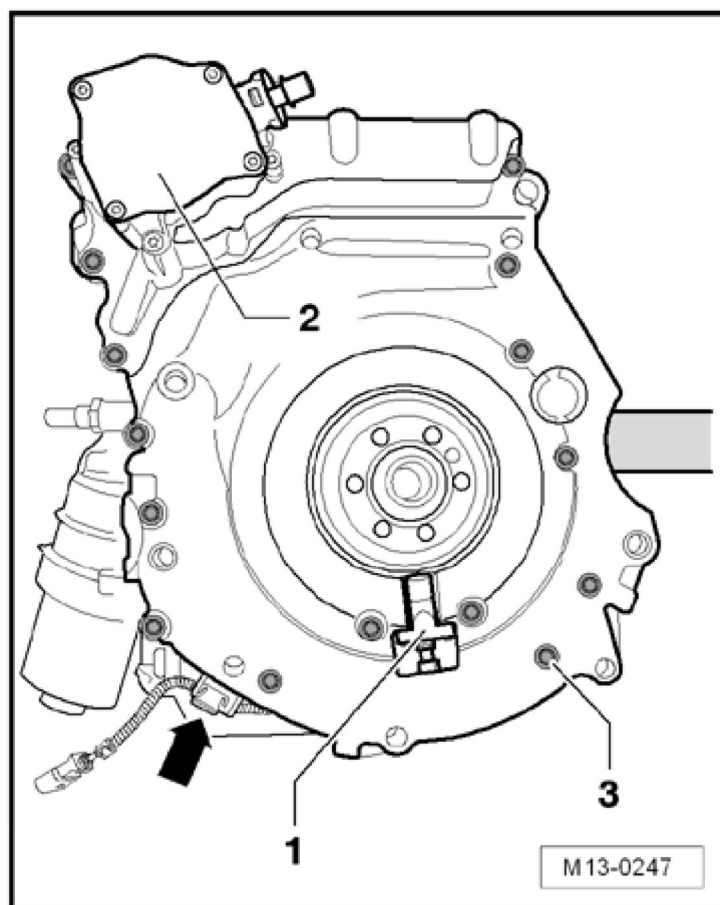


Fig. 50: Identifying Removal Points For Control Housing Cover -1- From Cylinder Block -2- And From Upper Oil Pan -3-

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Finally, tighten the bolts to the cylinder block and the upper oil pan to 25 Nm.
- Wipe off any sealant, which has leaked out.
- Drive the alignment sleeves in until seated, if necessary.
- Install a new crankshaft seal. Refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE**.

The rest of the installation follows the reverse of the removal procedures. When doing this note the following:

- Install the brake booster vacuum pump. Refer to **BRAKE BOOSTER VACUUM PUMP**.
- Install the cylinder head. Refer to **CYLINDER HEAD**.
- Install the flywheel/drive plate. Refer to **DRIVE PLATE**.
- Remove the locking pin T40069 from the rear of the cylinder block and install the locking bolt.
- Fill the coolant system. Refer to **DRAINING AND FILLING**.

Tightening Specifications

| Component | Nm |
|--|-------------|
| Flywheel/drive plate to crankshaft <ul style="list-style-type: none">• Replace bolts | 60 Nm + 90° |
| Locking bolt to cylinder block | 30 |

CRANKSHAFT SEAL, TRANSMISSION SIDE

Special tools and workshop equipment required

- Assembly Tool T10122
- Pulling Hook T20143

Removing

-- Remove the transmission.

-- Lock the crankshaft. Refer to **CRANKSHAFT, LOCKING.**

-- Remove the flywheel or the drive plate and remove the sensor wheel for the engine speed sensor -G28- from the crankshaft.

-- Pull out the seal using the pulling hook T20143/2.

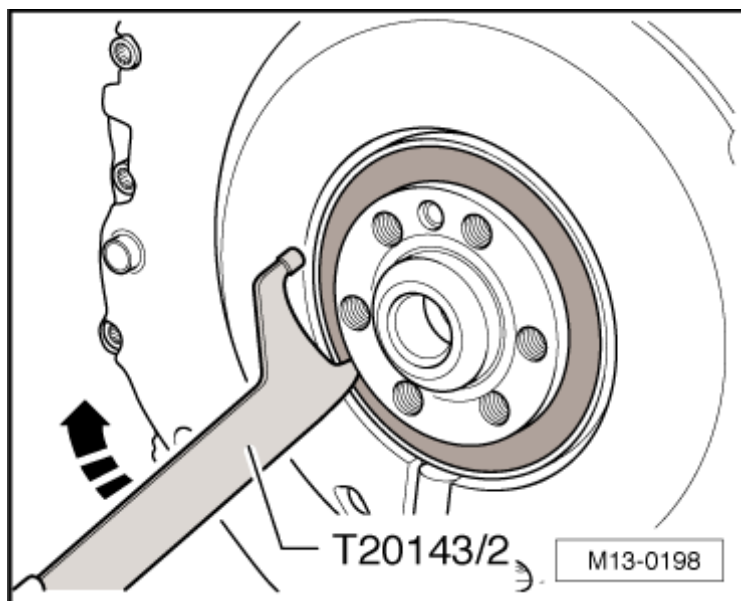


Fig. 51: Identifying Sealing Ring Pulled Out Using Pulling Hook T20143/2
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Do not damage the crankshaft sealing surface when doing this.

Installing

NOTE: **Do not additionally lubricate or grease the sealing lip of the seal!**

- Clean the sealing surfaces. They must be free of oil and grease.
- Before installing, remove any remaining oil from the end of the crankshaft with a clean cloth.
- Insert the assembly device T10122/1 onto the pull sleeve T10122/2 and slide the seal -A- onto the pull sleeve.

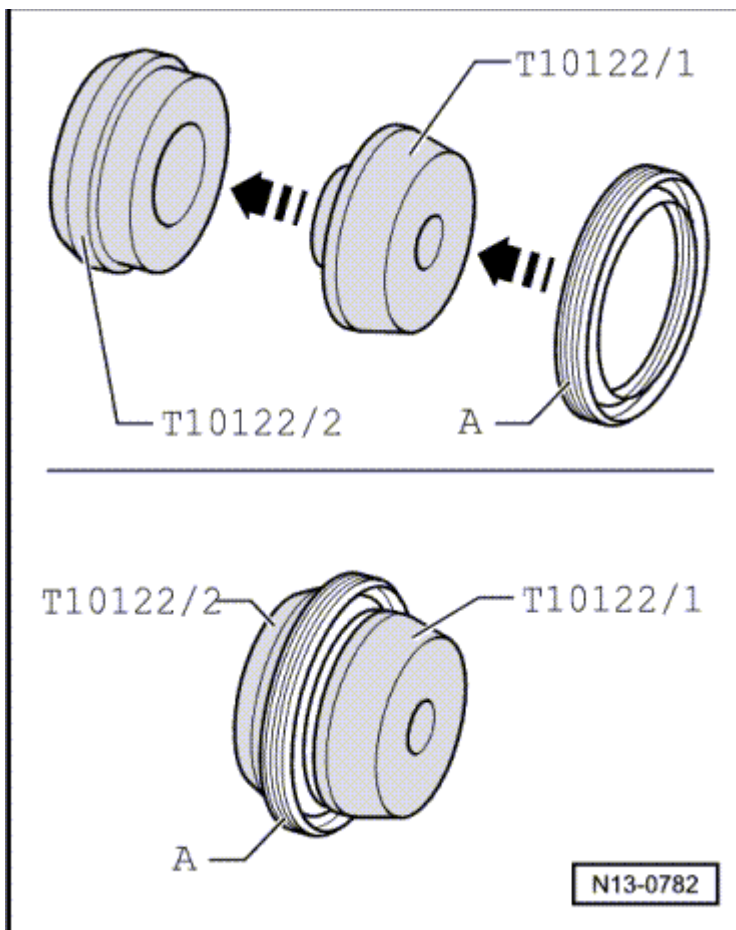


Fig. 52: Identifying Seal, Sleeve T10122/1 And Assembly Tool T10122/2
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the assembly device T10122/1.
- Install the pull sleeve T10122/2 with the seal -A- onto the crankshaft.

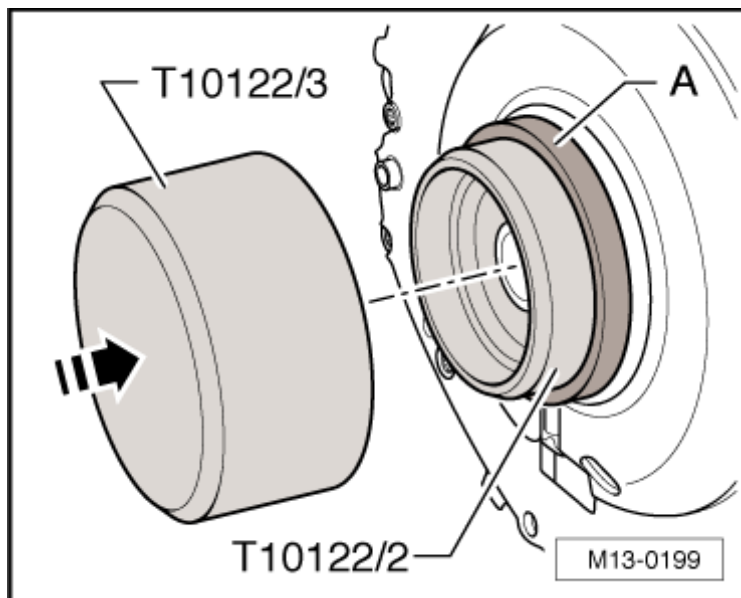


Fig. 53: Identifying Installation Of Pull Sleeve T10122/2 With Sealing Ring Onto Crankshaft
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Press in the seal all around evenly and flush using the pressure sleeve T10122/3.

The rest of the installation follows the reverse of the removal procedures. When doing this note the following:

- Remove the locking pin T40069 from the rear of the cylinder block and install the locking bolt.

Tightening Specifications

| Component | Nm |
|---|-------------|
| Flywheel/drive plate to crankshaft | 60 Nm + 90° |
| <ul style="list-style-type: none"> • Replace bolts | |
| Locking bolt to cylinder block | 30 |

DRIVE PLATE

Special tools and workshop equipment required

- Depth Gauge

Removing

-- Remove the transmission.

-- Lock the crankshaft and remove the drive plate, refer to **CRANKSHAFT, LOCKING**.

Installing

-- Install the drive plate only by using a washer with recesses -1- (without compensating shim -2-).

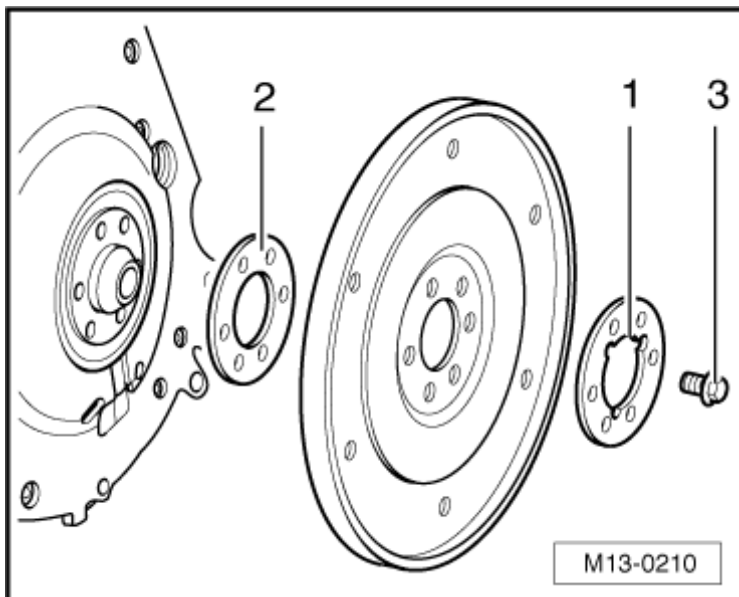


Fig. 54: Identifying Drive Plate Installed Only By Using Washer With Recesses
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Install new bolts -3- and tighten them to 30 Nm.

-- Check the dimension -a- at three points and calculate the mean value.

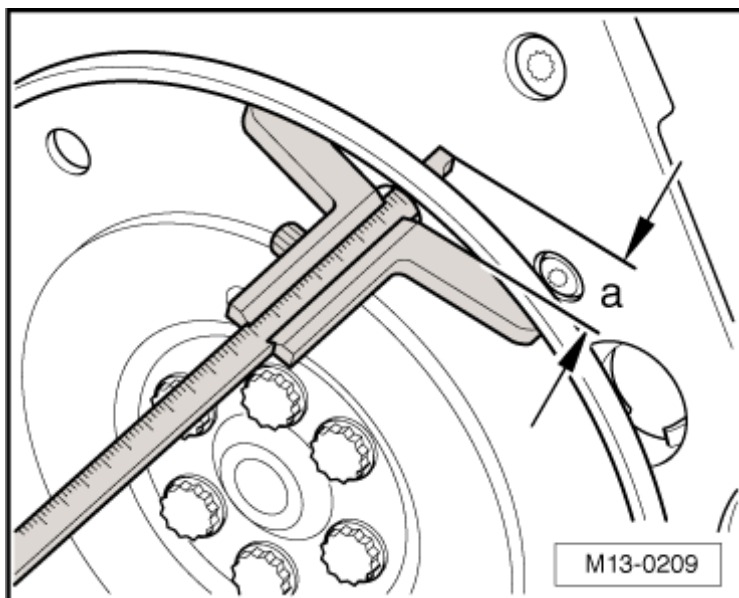


Fig. 55: Identifying Check Of Dimension
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Specified value: 18.8 to 20.4 mm

NOTE: Measure through the drive plate hole to the surface of the control housing cover.

If the specification is not obtained:

-- Remove the drive plate again and use the shim -2-. Tighten the bolts -3- to 30 Nm again and repeat the measurement.

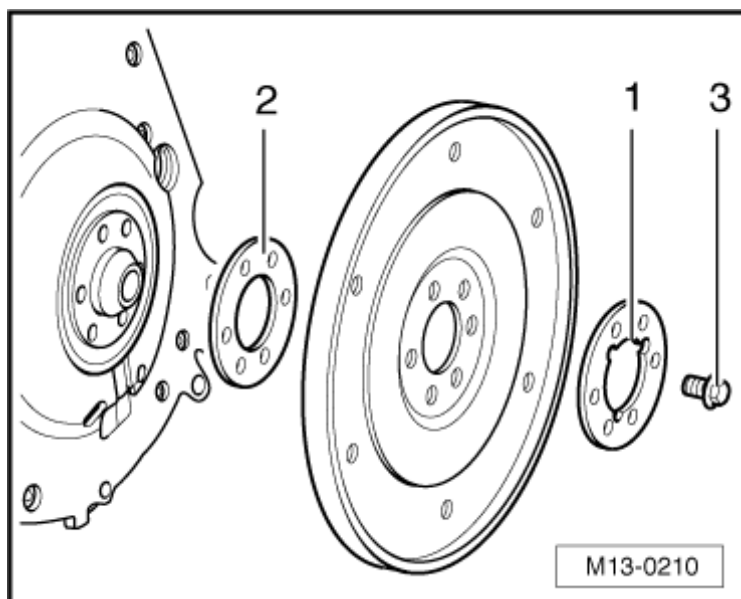


Fig. 56: Identifying Drive Plate Installed Only By Using Washer With Recesses
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

If the specified value is OK:

-- Tighten the bolts to 60 Nm + an additional + 90° (1/4) turn, the additional turn n may occur in several stages.

The rest of the installation follows the reverse of the removal procedures. When doing this note the following:

- Remove the locking pin T40069 from the rear of the cylinder block and install the locking bolt.

Tightening Specifications

| Component | Nm |
|--------------------------------|----|
| Locking bolt to cylinder block | 30 |

SPECIAL TOOLS

Special tools and workshop equipment required

- Locking Pin T10060 A

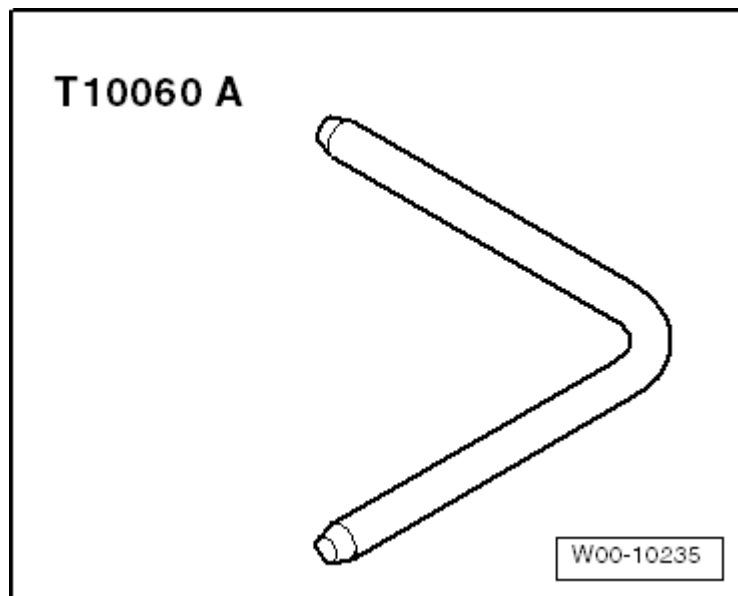


Fig. 57: Identifying Locking Pin T10060 A
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Oil Seal Guide Sleeve T03004

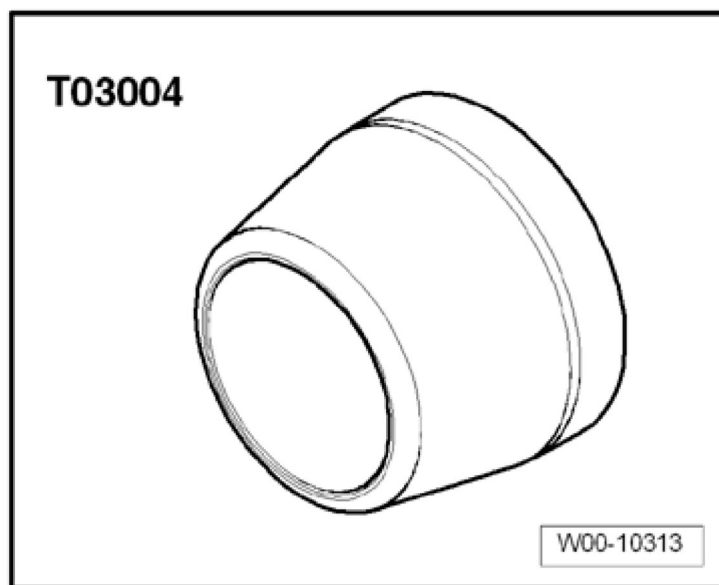


Fig. 58: Identifying Assembly Sleeve T03004
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Torque Wrench (40-200 Nm) V.A.G 1332

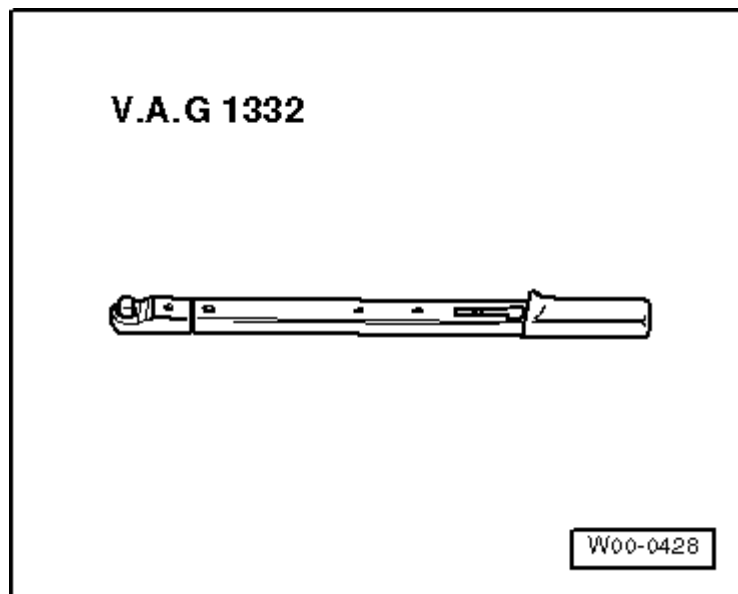


Fig. 59: Identifying Torque Wrench 40-200 Nm VAG 1332
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Assembly Tool T10122

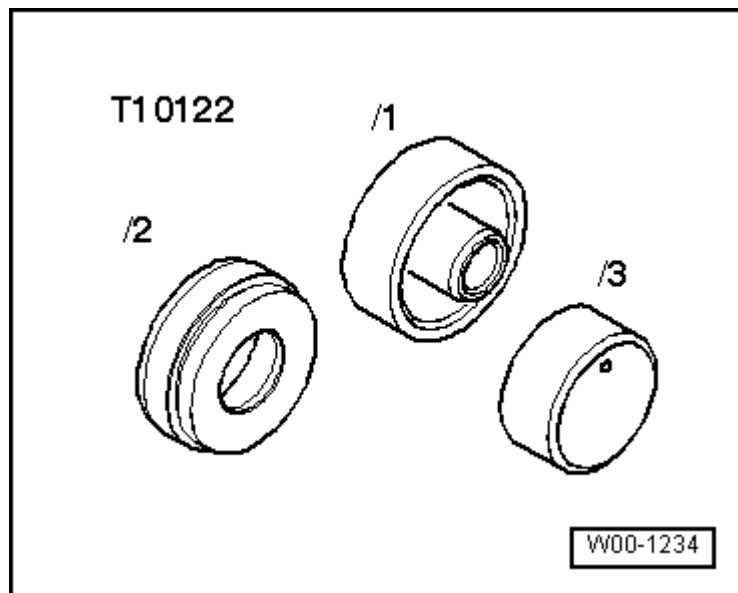


Fig. 60: Identifying Pulling Fixture T10122
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Pulling Hook T20143

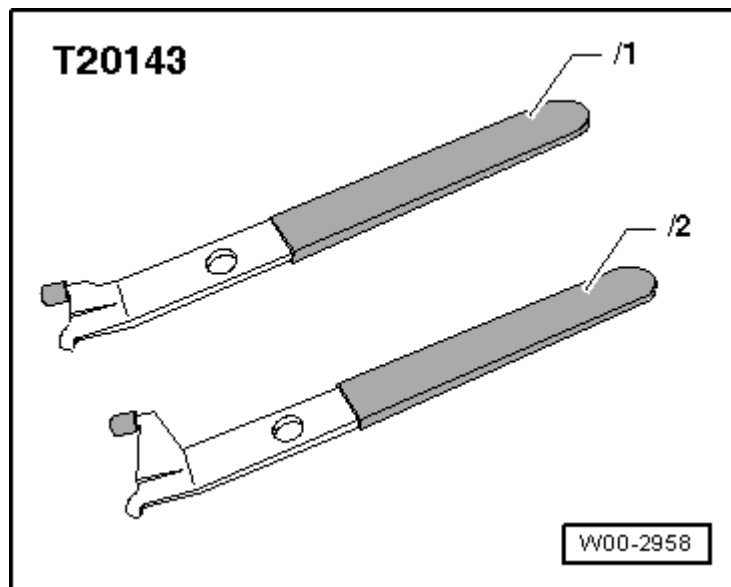


Fig. 61: Identifying Extractor Hook T20143

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Trim Removal Wedge 3409

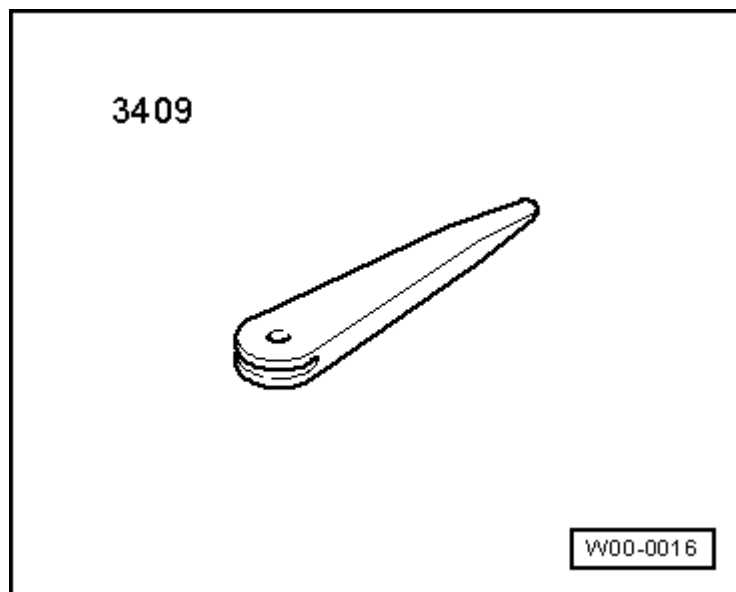


Fig. 62: Identifying 3409 Wedge

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

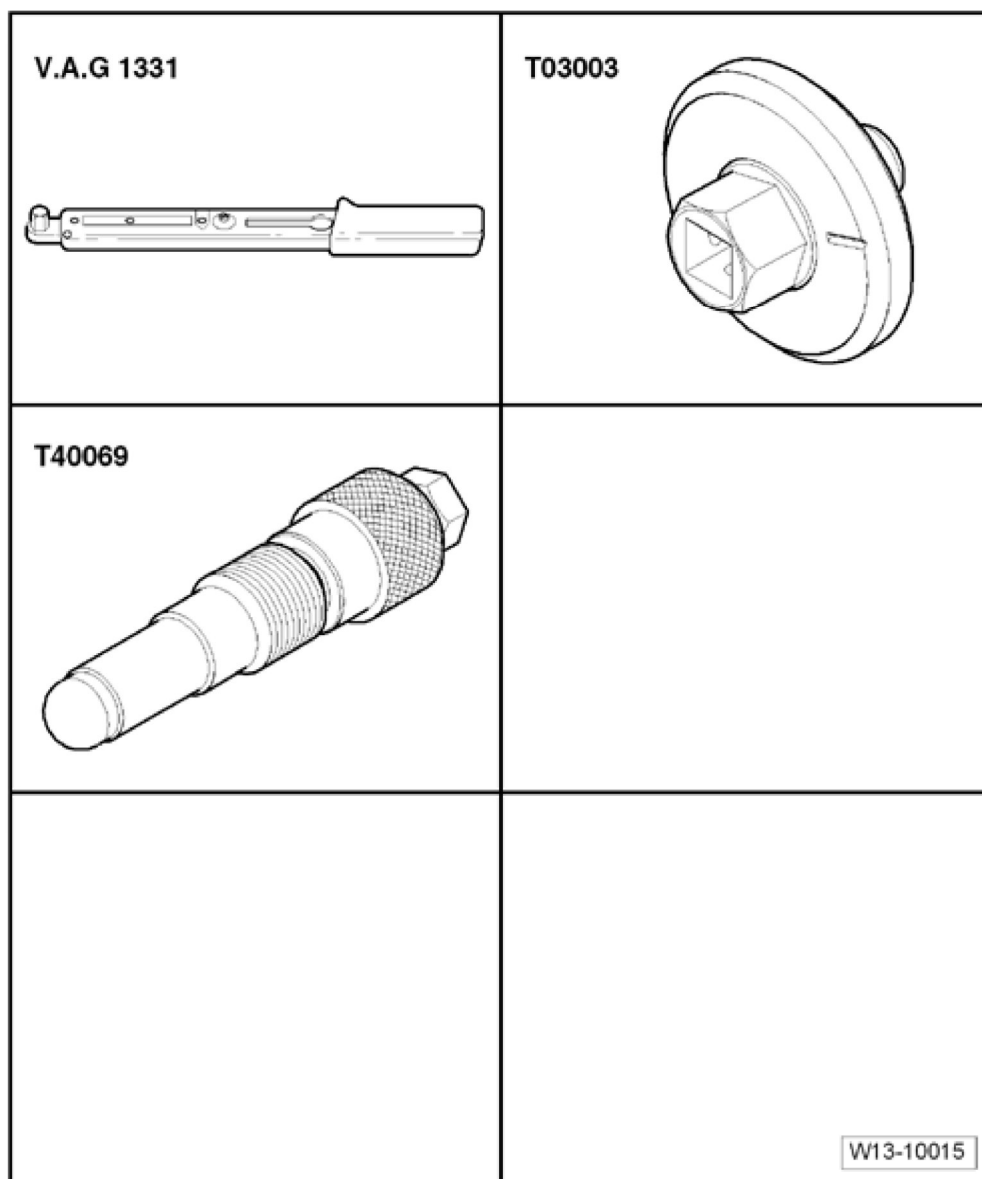


Fig. 63: Identifying Special Tools -- Crankshaft, Securing
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Crankshaft Adapter T03003
- Locking Pin T40069

ENGINE

2.5 Liter - Cylinder Head, Valvetrain - Engine Code(s): CBUA (SportWagen)

15 CYLINDER HEAD, VALVETRAIN

DESCRIPTION AND OPERATION

CYLINDER HEAD AND COVER OVERVIEW

NOTE: If a replacement cylinder head is installed, several contact surfaces between the support elements, roller rockers and cam lubricating surfaces of the camshaft must be lubricated before installing the cylinder head cover.

The plastic protectors installed to protect the open valves must only be removed immediately before installing the cylinder head.

Replace the cylinder head bolts.

When replacing the cylinder head or cylinder head gasket, the coolant must be completely replaced.

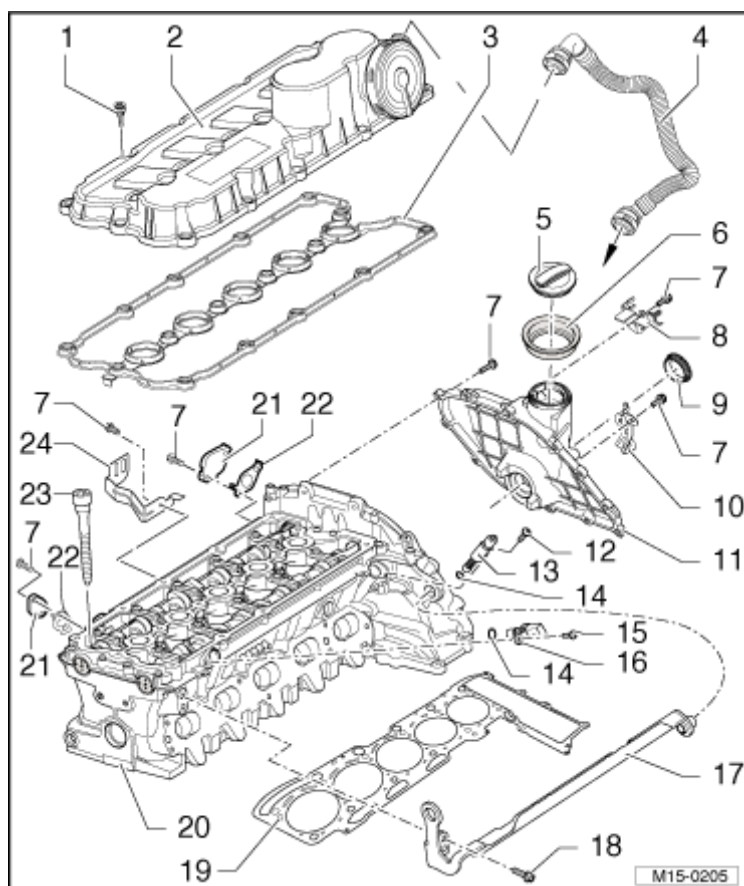


Fig. 1: Identifying Cylinder Head, Assembly Overview**Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.**

1. **Bolt**
 - 10 Nm
2. **Cylinder Head Cover**
 - With the pressure regulator valve for the crankshaft housing ventilation.
 - Tightening sequence, refer to **Fig. 2**.
 - Removing and installing, refer to **CYLINDER HEAD COVER**.
3. **Cylinder Head Cover Gasket**
 - Replace if damaged or leaking.
4. **Crankcase Ventilation Hose**
 - To the intake manifold.
5. **Oil Filler Cap**
6. **Gasket**
 - Replace if damaged or leaking.
7. **Bolt**
 - 10 Nm
8. **Wire Bracket**
9. **Seal**
 - Removing and installing, refer to **CHAIN COMPARTMENT COVER SEAL**.
10. **Wire Bracket**
11. **Chain Compartment Cover**
 - Removing and installing, refer to **CHAIN COMPARTMENT COVER**.
12. **Bolt**
 - 2 Nm
13. **Camshaft Adjustment Valve 1 -N205-**
 - Check using the vehicle diagnosis, testing and information system VAS 5051.
14. **O-ring**
 - Replace if damaged.
 - For the camshaft position sensor, refer to "Camshaft Position Sensor -G40-" in item: 16 no replacement part.
15. **Bolt**
 - 10 Nm
16. **Camshaft Position Sensor -G40-**
17. **Transport Strap**
18. **Bolt**
 - 25 Nm
19. **Cylinder Head Gasket**

- Always replace.
- After replacing, replace the entire amount of coolant.

20. Cylinder Head

- Removing and installing, refer to **CYLINDER HEAD**.
- Checking the cylinder head for warpage, refer to **Fig. 3**.
- It is not permitted to rework the sealing surface.
- With the coolant pipe connection pressed in.

-- If necessary, remove coolant deposits using a copper wire brush or fine sandpaper (minimum 100 grit).

-- If the pipe connection is worn, replace it using liquid locking fluid D 000 600 A2.

21. Cap

- On engines without a Secondary Air Injection (AIR) system only.
- Engines with a AIR system, refer to **SECONDARY AIR INJECTION SYSTEM OVERVIEW**.

22. Gasket

- Always replace.

23. Bolt

- 40 Nm + 180° (1/2) additional turn.
- Always replace.
- Follow the loosening/tightening sequence. Refer to **CYLINDER HEAD**.

24. Wire Bracket

- For the heated oxygen sensor -G39-.

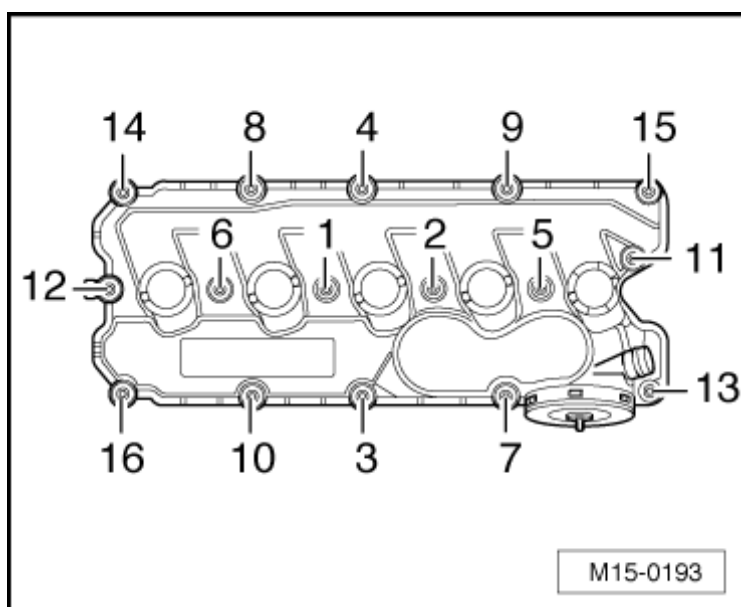


Fig. 2: Identifying Cylinder Head Cover Bolt Removal Sequence

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

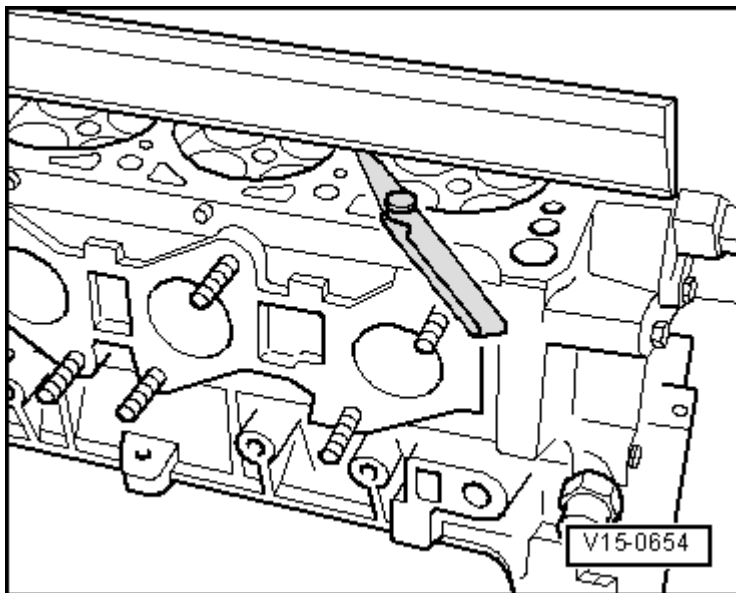


Fig. 3: Identifying Check Of Cylinder Head For Distortion
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Check the cylinder head at multiple points for distortion, using a straight edge and feeler gauges.

- Maximum permissible distortion: 0.05 mm

If this value is exceeded, the cylinder head must be replaced. It is not permissible to rework the sealing surface.

VALVE TIMING, ADJUSTING

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Torque Wrench (40-200 Nm) V.A.G 1332
- Locking Pins T03006
- Multipoint Socket T10035
- Counterhold Tool Touareg V10 T10172
- Camshaft Clamp T40070
- 2 M8 x 16 Bolts

Modifying the Counterhold Tool Touareg V10 T10172:

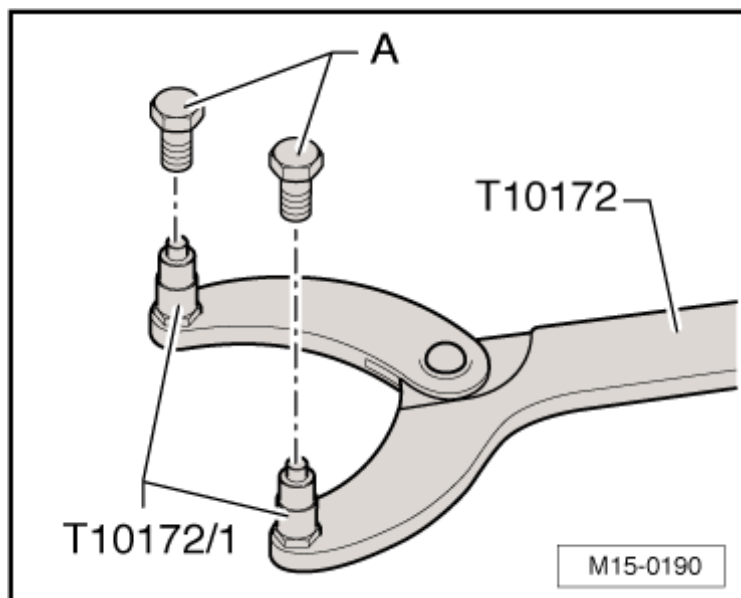


Fig. 4: Identifying Bolts Attached To Adapter T10172/1 For Installation
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the adapters T10172/1 and install 2 M8 x 16 bolts -A-.

NOTE: **The valve timing must be adjusted if the camshaft sprockets were loosened during repairs or if the valve timing is not set.**

Securing the Camshafts if the Valve Timing is Correct:

-- Remove the chain compartment cover. Refer to **CHAIN COMPARTMENT COVER**.

-- Remove the cylinder head cover. Refer to **CYLINDER HEAD COVER**.

-- Lock the crankshaft for adjusting the valve timing. Refer to **TO CHECK/ADJUST VALVE TIMING**.

-- Install the camshaft clamp T40070 as shown onto the camshafts and tighten the bolts to 20 Nm.

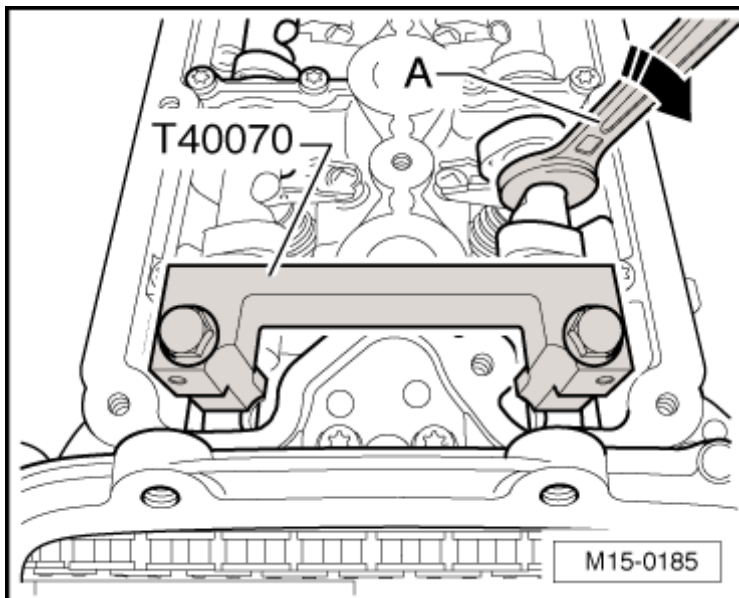


Fig. 5: Identifying Camshaft Clamp T40070 Installed On To Camshafts
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

If the bolts could not be installed easily, attempt to rotate the exhaust camshaft at the recess using an open end wrench -A- (18 or 19 mm, depending on wrench width) slightly in the -direction of the arrow- in order to eliminate any play in the chain.

-- Relieve the tension on the timing chain. To do so, insert a screwdriver of appropriate size between the piston in the chain tensioner and the tensioning rail and press in the -direction of the arrow-.

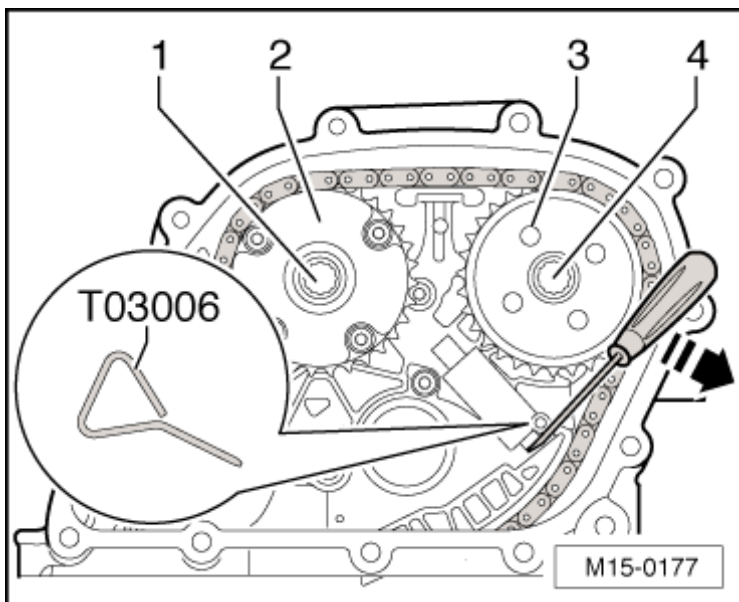


Fig. 6: Identifying Chain Sprockets Placed Into Timing Chain
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Secure the completely pressed in piston using the locking pin T03006. The locking pin must be inserted until

it stops.

Securing the Camshafts if the Valve Timing is Not Correct:

-- Remove the chain compartment cover. Refer to **CHAIN COMPARTMENT COVER**.

-- Rotate the crankshaft to Top Dead Center (TDC) for cylinder 5, refer to **TO CHECK/ADJUST VALVE TIMING** , however do not lock the crankshaft using the locking pin T40069.

-- Rotate the crankshaft so that the camshaft clamp T40070 can be installed easily onto the camshafts as shown.

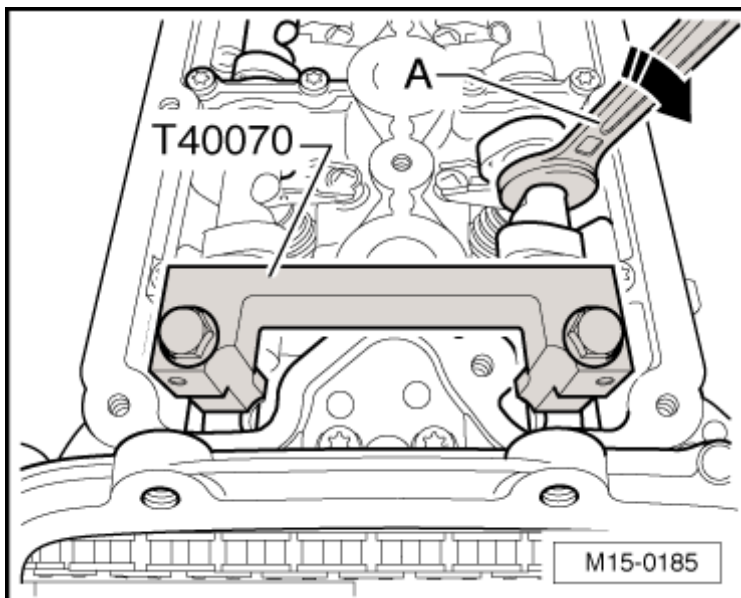


Fig. 7: Identifying Camshaft Clamp T40070 Installed On To Camshafts
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten the camshaft clamp T40070 bolts to 20 Nm.

Removing the Adjuster and Sprocket from the Camshafts:

-- Relieve the tension on the timing chain. To do so, insert a screwdriver of appropriate size between the piston on the chain tensioner and the tensioning rail and press in the -direction of the arrow-.

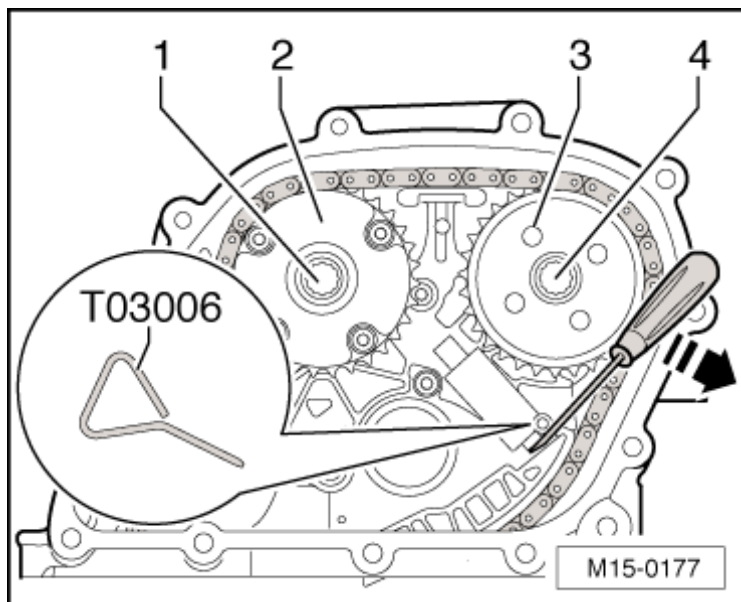


Fig. 8: Identifying Chain Sprockets Placed Into Timing Chain
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Secure the completely pressed in piston using the locking pin T03006. The locking pin must be inserted until it stops.

-- Remove the bolts -1- and 4- using the multipoint socket T10035 and remove the adjuster -2- and sprocket -3-.

If necessary, the sprocket -3- must be pried off lightly using a screwdriver.

NOTE: Lock the crankshaft, refer to **CRANKSHAFT, LOCKING** if not yet secured. The crankshaft must only be rotated slightly around the TDC point for this. Otherwise there is a risk the valves rest on the pistons.

Valve Timing, Adjusting

- The crankshaft is secured by the locking pin T40069
- The camshafts are secured by the camshaft clamp T40070
- The chain tensioner is tensioned

-- Place the adjuster -2- and sprocket -3- into the timing chain, place them onto the camshafts and hand tighten the new bolts -1- and 4-.

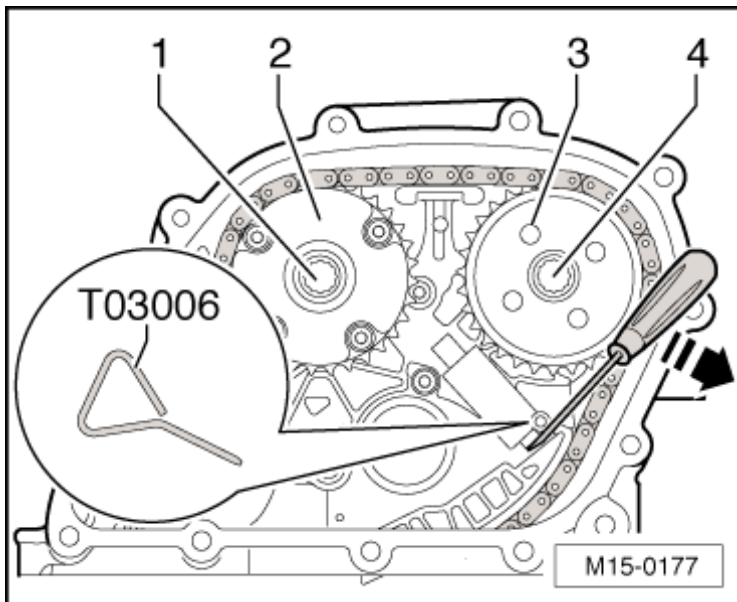


Fig. 9: Identifying Chain Sprockets Placed Into Timing Chain
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The adjuster and sprocket must still be able to be rotated, however they must not tilt.

NOTE: Make sure that the timing chain lies correctly in the guide and tensioning rails.

-- Relieve the tension on the chain tensioner by pressing in the piston and pulling out the locking pin T03006.

-- Install the modified counterhold tool Touareg V10 T10172 onto the sprocket -4- for the exhaust camshaft.

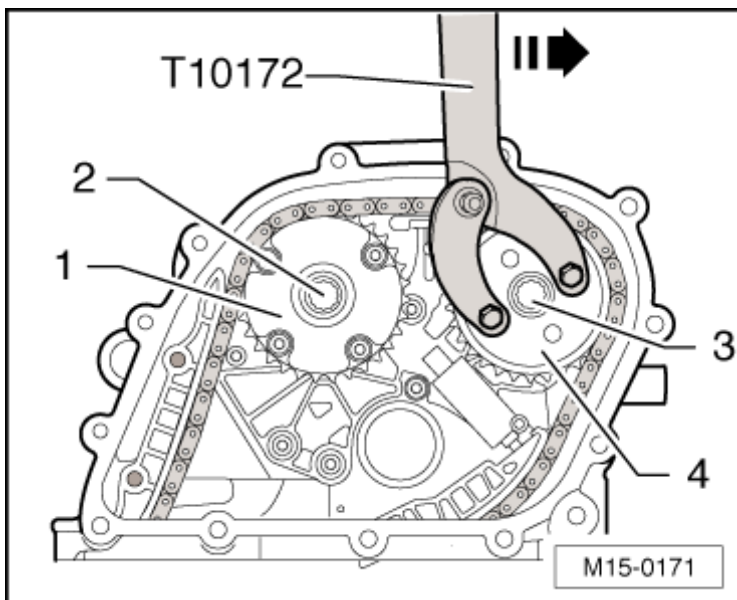


Fig. 10: Identifying Modified Counterhold Tool Touareg V10 T10172 Attached On To Chain Sprocket For Exhaust Camshaft

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: A second mechanic is required for the following steps.

-- Hold the timing chain at preload by pressing the counterhold tool Touareg V10 T10172 in the -direction of the arrow-.

-- Simultaneously tighten the bolt -2- fro the intake camshaft first and then the bolt -3- fro the exhaust camshaft to 60 Nm.

Then, tighten the bolts -2 and 3- an additional 90° (1/4) turn.

NOTE: When applying the additional torque of 90°, the timing chain must no longer be held at preload.

-- Remove the camshaft clamp T40070.

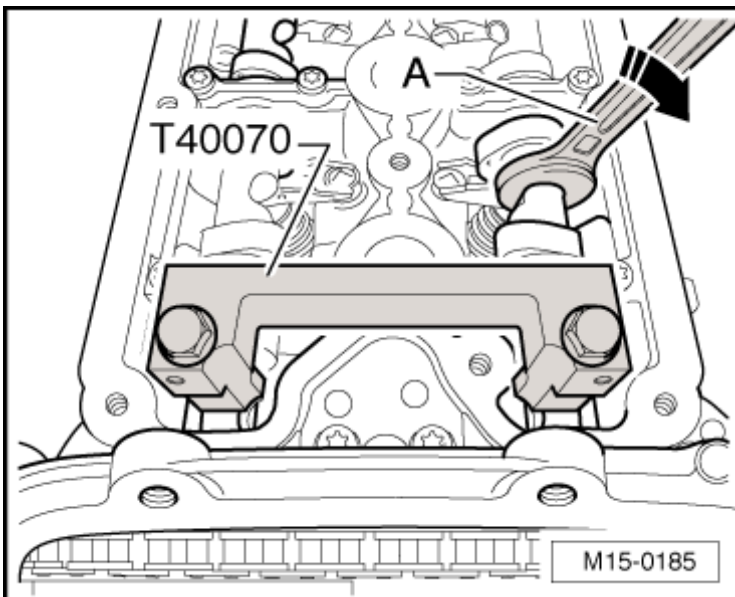


Fig. 11: Identifying Camshaft Clamp T40070 Installed On To Camshafts
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the locking pin T40069.

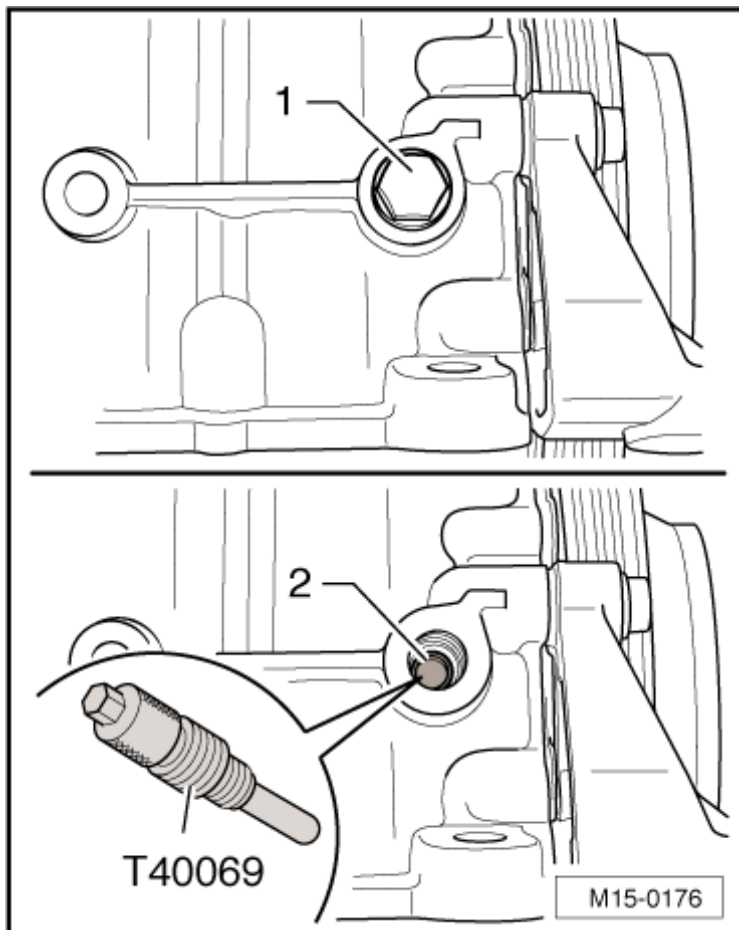


Fig. 12: Identifying Crankshaft Must Not Be Rotated Out Over TDC Marking
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Rotate the crankshaft 2 revolutions in engine rotation direction and lock the crankshaft. Refer to **TO CHECK/ADJUST VALVE TIMING** .

-- Check the valve timing. Refer to **VALVE TIMING, CHECKING**.

If the valve timing is not correct:

-- Loosen the adjuster and sprocket bolts on the camshafts again and adjust the valve timing again (replace the camshaft bolts).

The rest of the installation follows the reverse of the removal procedures. When doing this note the following:

- Remove the locking pin T40069 from the rear of the cylinder block and install the locking bolt.
- Fill the coolant system. Refer to **DRAINING AND FILLING** .

VALVETRAIN OVERVIEW

NOTE: **Cylinder heads with cracks between the valve seats, or between the valve seat**

and the spark plug threads, can continue to be used without reducing the service life, as long as the cracks have a Max. width of 0.3 mm, or only the first 4 threads of the spark plug threads are cracked.

The cylinder head and guide frame must be replaced together.

Do not regrind the valve seats in the cylinder head, only hand lapping the valves is permitted.

Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic lash adjusters must seat themselves (otherwise the valves will seat themselves on the pistons).

After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.

Always replace the gaskets and seals.

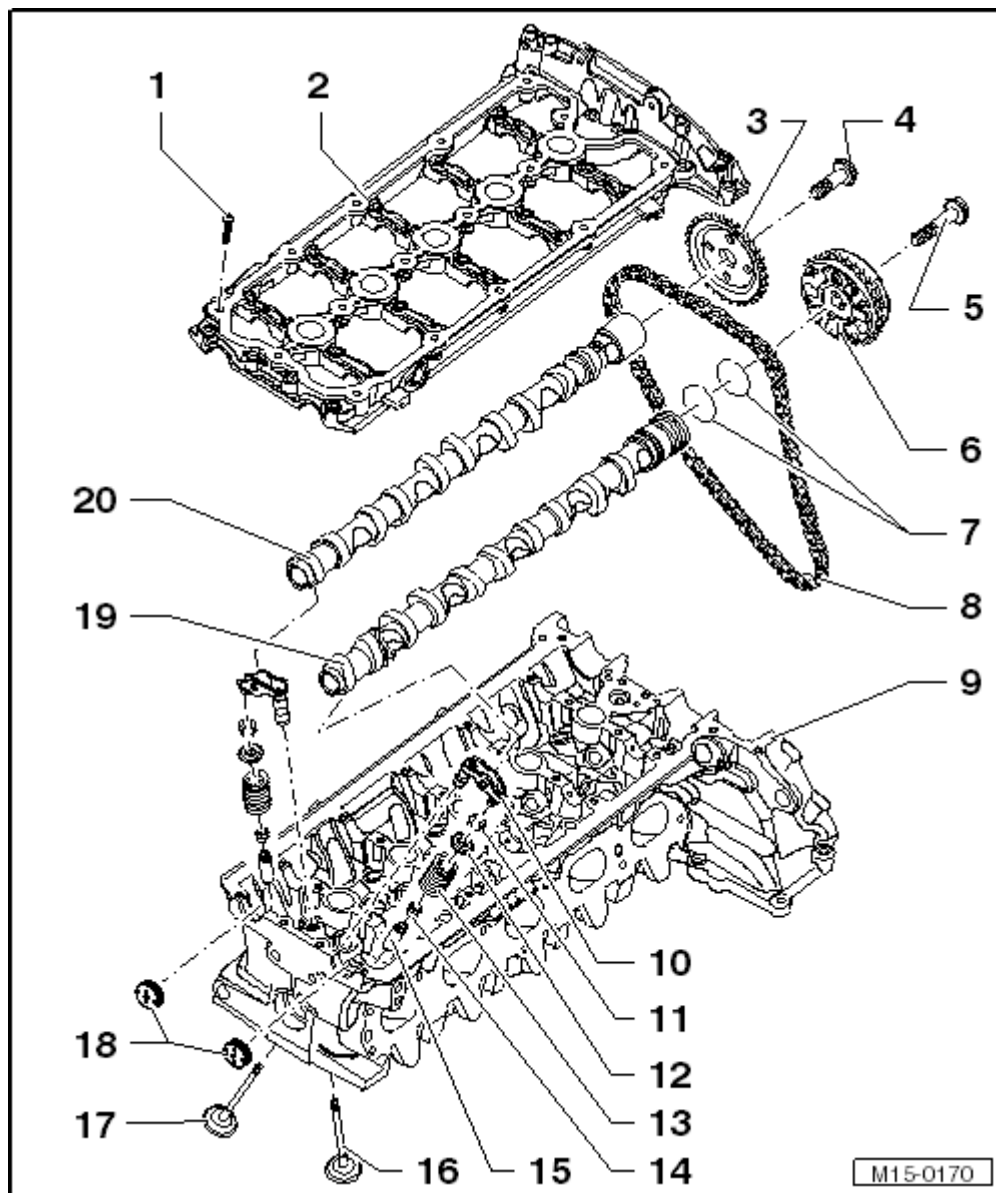


Fig. 13: Identifying Valvetrain, Assembly Overview
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Bolt

- 8 Nm + 90° (1/4) additional turn.
- Always replace.

2. Guide Frame

- Removing and installing, refer to **CAMSHAFTS**.
- With integrated camshaft bearings.
- Clean the sealing surface, reworking is not permitted.
- Remove any old sealant residue.

3. Sprocket

- For the exhaust camshaft.
4. **Bolt**
 - 60 Nm + 90° (1/4) additional turn.
 - Always replace.
 5. **Bolt**
 - 60 Nm + 90° (1/4) additional turn.
 - Always replace.
 6. **Camshaft Adjuster**
 - For the intake camshaft.
 7. **Seals**
 - For the camshaft adjuster.
 - Note the installed position, refer to CAMSHAFTS.
 8. **Timing Chain**
 - Removing from the adjuster/sprocket, refer to VALVE TIMING, ADJUSTING.
 9. **Cylinder Head**
 - Do not regrind the valve seats, only hand lapping is permitted.
 10. **Roller Rocker Arm with Hydraulic Lash Adjuster**
 - Do not interchange.
 - Lubricate the contact surface.
 11. **Valve Retainers**
 12. **Upper Spring Seat**
 13. **Valve Spring**
 14. **Valve Stem Seal**
 - Removing and installing, refer to VALVE STEM SEALS.
 15. **Valve Guide**
 - Checking, refer to VALVE GUIDE, CHECKING.
 16. **Intake Valve**
 - Do not regrind, only lapping is permitted.
 - For the correct valve dimensions, refer to VALVE DIMENSIONS.
 - Valve guide, checking. Refer to VALVE GUIDE, CHECKING.
 17. **Exhaust Valve**
 - Do not regrind, only lapping is permitted.
 - For the correct valve dimensions, refer to VALVE DIMENSIONS.
 - Valve guide, checking. Refer to VALVE GUIDE, CHECKING.
 18. **Sealing Plugs**
 - Always replace.
 - Installing, refer to CAMSHAFTS.
 19. **Intake Camshaft**

- Removing and installing, refer to CAMSHAFTS.
- Check the radial clearance using Plastigage (roller rocker arm removed).

Wear limit: 0.1 mm.

- Runout: Max. 0.035 mm.
- Axial clearance: Max. 0.17 mm.

20. Exhaust Camshaft

- Removing and installing, refer to CAMSHAFTS.
- Check the radial clearance using Plastigage (roller rocker arm removed).

Wear limit: 0.1 mm.

- Runout: Max. 0.035 mm.
- Axial clearance: Max. 0.17 mm.

SPECIFICATIONS

VALVE DIMENSIONS

NOTE: Intake and exhaust valves must not be refaced by grinding. Only lapping is permitted.

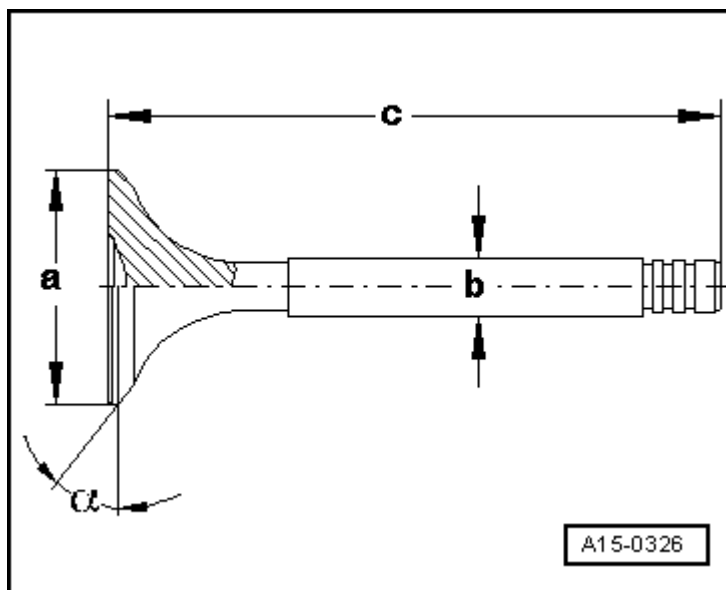


Fig. 14: Identifying Valve Dimensions

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

| Dimension | | Intake Valve | Exhaust Valve |
|------------|----|---------------|---------------|
| Diameter a | mm | 26.80•••27.00 | 29.80•••30.00 |

2013 Volkswagen Jetta SE

ENGINE 2.5 Liter - Cylinder Head, Valvetrain - Engine Code(s): CBUA (SportWagen)

| | | | |
|------------|--------|-----------------|-----------------|
| Diameter b | mm | 5.95...5.97 | 5.94...5.95 |
| c | mm | 104.84...105.34 | 103.64...104.14 |
| a | Angle° | 45 | 45 |

FASTENER TIGHTENING SPECIFICATIONS

| Component | Fastener Size | Nm |
|---|---------------|----------|
| Camshaft Adjustment Valve 1 to Cylinder Head Bolt | - | 2 |
| Camshaft Clamp T40070 to Camshaft Bolt | - | 20 |
| Camshaft Position Sensor to Cylinder Head Bolt | - | 10 |
| Chain Compartment Cover to Cylinder Head Bolt | - | 10 |
| Coolant Thermostat Housing to Chain Compartment Cover Bolt | - | 10 |
| Exhaust Camshaft Sprocket to Camshaft Bolt ⁽¹⁾ | - | 60 + 90° |
| Intake Camshaft Adjuster to Camshaft Bolt ⁽¹⁾ | - | 60 + 90° |
| Locking Bolt to Cylinder Block | - | 30 |
| Secondary Air Injection Connecting Pipe to Cylinder Head Bolt | - | 10 |
| Transport Strap to Cylinder Block Bolt | - | 25 |
| Wire Bracket to Chain Compartment Cover Bolt | - | 10 |
| (1) Always replace | | |

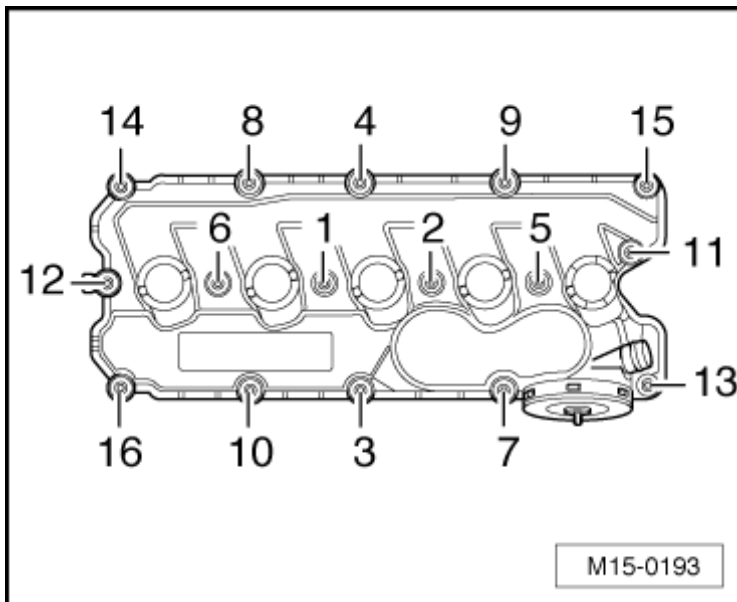
Cylinder Head Cover Bolt Tightening Sequence and Specification

Fig. 15: Identifying Cylinder Head Cover Bolt Removal Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten the cylinder head cover bolts -1 through 16- in the sequence shown to 10 Nm.

Cylinder Head Bolt Tightening Sequence and Specification

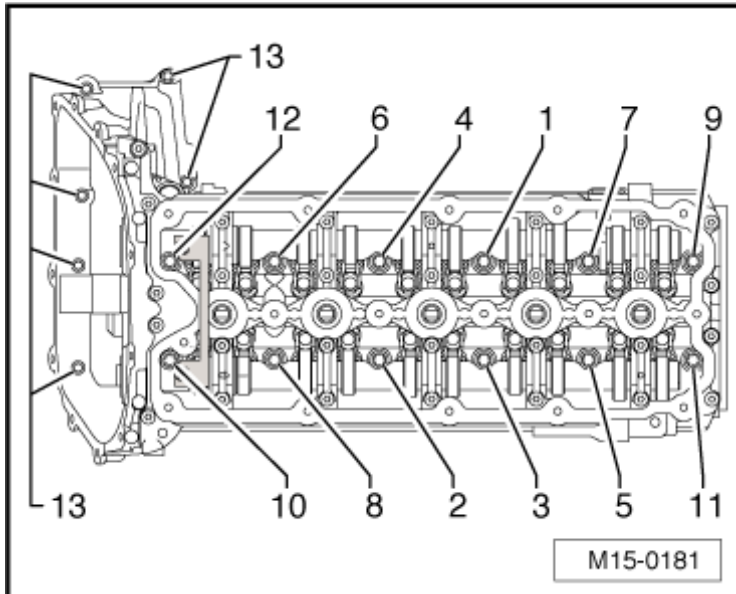


Fig. 16: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Then tighten the cylinder head bolts -1 through 12- in the sequence shown as follows:

| Step | Tighten |
|------|---|
| 1 | -- Using a torque wrench, tighten the bolts to 40 Nm. |
| 2 | -- Using a ratchet, tighten the bolts an additional 90° (1/4) turn. |
| 3 | -- Using ratchet, tighten the bolts an additional 90° (1/4) turn. |

-- Then, tighten the bolts -13- to 10 Nm.

Guide Frame Bolt Tightening Sequence and Specification

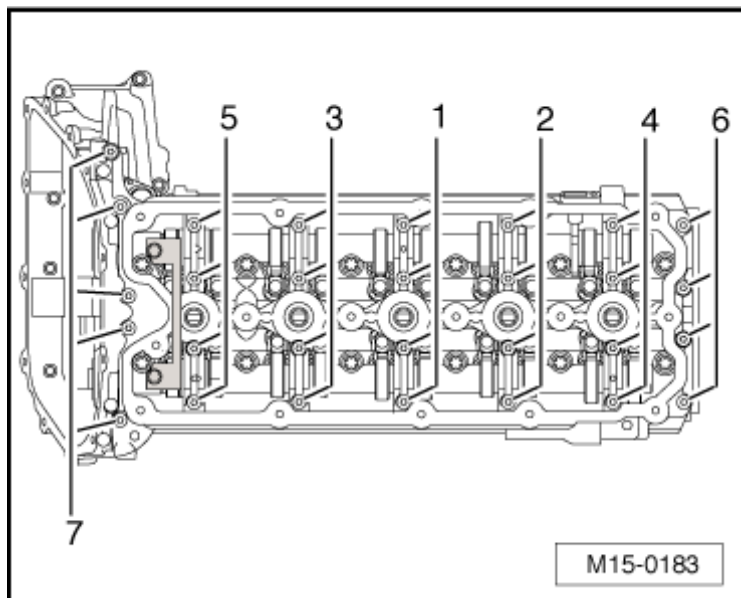


Fig. 17: Identifying Tightening Bolts Sequence

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten the NEW bolts -1 through 7- to 8 Nm in the sequence shown.

-- After that, continue to tighten all the bolts an additional 90° (1/4) turn.

DIAGNOSIS AND TESTING

VALVE TIMING, CHECKING

Special tools and workshop equipment required

- Camshaft Clamp T40070

Procedure

-- Remove the cylinder head cover. Refer to **CYLINDER HEAD COVER**.

-- Lock the crankshaft for checking the valve timing. Refer to **TO CHECK/ADJUST VALVE TIMING** .

Valve Timing is Correct:

Valve timing is correct when the bolts for the camshaft clamp T40070 can be easily installed to the end into camshafts as shown. The support surfaces of the camshaft clamp T40070 must lie flat on the flats of the camshafts when doing this.

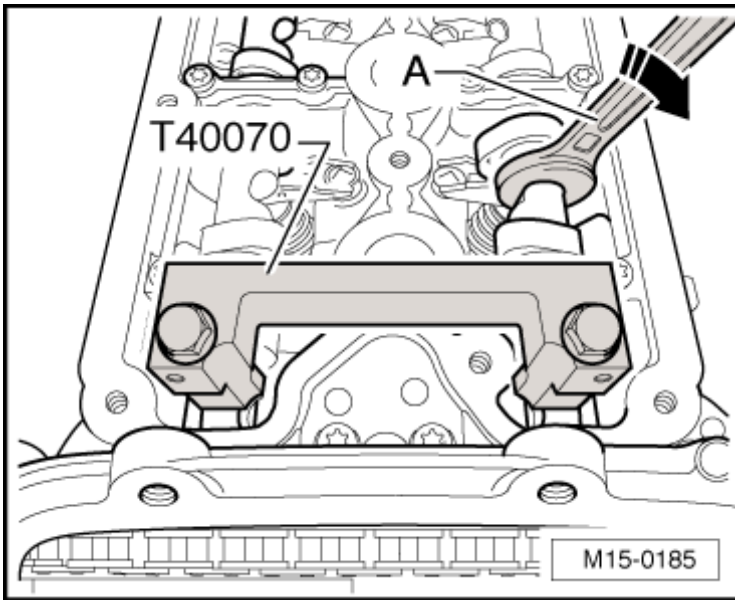


Fig. 18: Identifying Camshaft Clamp T40070 Installed On To Camshafts
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- If the bolts could not be installed easily, attempt to rotate the exhaust camshaft at the recess using an open end wrench -A- (18 or 19 mm, depending on wrench width) slightly in the -direction of the arrow- in order to eliminate any play in the chain.

If the bolts for the camshaft clamp T40070 can now be easily installed with the chain tensioned in this manner, the valve timing is correct. Possibly the crankshaft was not locked correctly.

Valve Timing is Not Correct:

The valve timing is not correct when the bolts for the camshaft clamp T40070 cannot be easily installed into the ends of the camshafts despite the tensioned chain.

- In this case, the valve timing must be adjusted. Refer to **VALVE TIMING, ADJUSTING**.

Assembly

Assembly is performed in the reverse order of removal. When doing this note the following:

- Remove the locking pin T40069 from the rear of the cylinder block and install the locking bolt (30 Nm).

COMPRESSION, CHECKING

Special tools and workshop equipment required

- Spark Plug Removal Tool 3122 B
- Ignition Coil Puller T40039
- Torque Wrench (5-50 Nm) V.A.G 1331

- Compression Tester V.A.G 1763
- Adapter V.A.G 1381/5A

Test Conditions:

- The engine oil temperature must be at least 30 °C (86 °F).
- The voltage supply is OK.

-- Remove the engine cover with air filter. Refer to **ENGINE COVER WITH AIR FILTER** .

-- Disconnect the connectors from all the fuel injectors.

-- Remove the ignition coils with power output stage. Refer to **IGNITION COILS WITH POWER OUTPUT STAGES** .

-- Remove the spark plugs using the spark plug removal tool 3122 B.

-- Check the compression using the compression tester V.A.G 1763 and the adapter V.A.G 1381/5A.

NOTE: **Using the tester, refer to the operating instructions.**

-- Have a second technician operate the starter.

-- Operate starter until the tester shows no further pressure increase.

Compression Pressure:

| New Bar Positive Pressure | Wear Limit Bar Positive Pressure | Difference Between Cylinders Bar Positive Pressure |
|---------------------------|----------------------------------|--|
| 9.0•••13.0 | 8.0 | Max. 3.0 |

-- To conclude work, erase the Diagnostic Trouble Code (DTC) memory of the Engine Control Module (ECM) since malfunctions were stored by disconnecting the connectors. Refer to **ENGINE CONTROL MODULE DTC MEMORY, CHECKING AND ERASING** .

VALVE GUIDE, CHECKING**Special tools and workshop equipment required**

- Dial gauge holder VW 387
- Dial gauge

-- Insert the new valve into the guide. The tip of the valve stem must seal with the guide. Due to differences in valve stem diameters, make sure that only intake valves are used to check intake valve guides, and only exhaust valves are used to check exhaust valve guides.

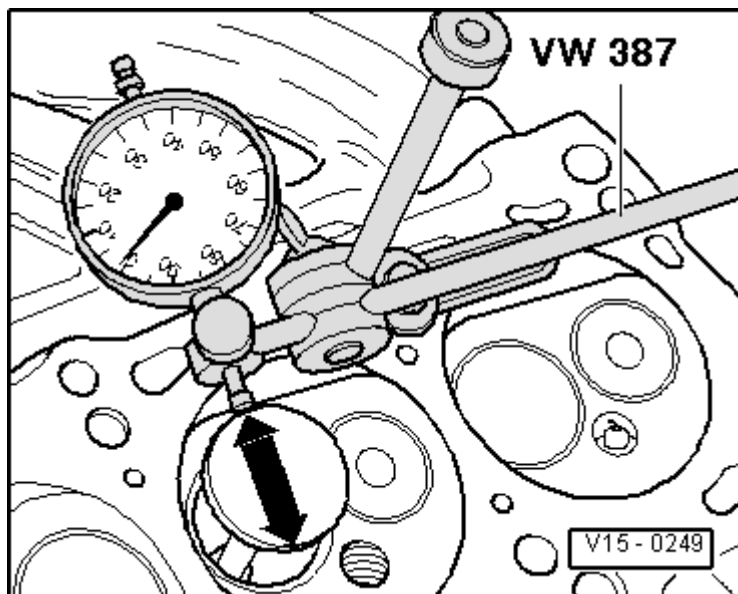


Fig. 19: Identifying Tools To Determine Tilt Clearance
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Determine the tilt clearance.

Wear limit: 0.8 mm.

If the tilt clearance is exceeded:

-- Replace the cylinder head.

REMOVAL AND INSTALLATION

CYLINDER HEAD COVER

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331

Removing

-- Remove the engine cover with air filter. Refer to **ENGINE COVER WITH AIR FILTER** .

-- Remove the vent tube for the crankshaft housing ventilation -arrow-.

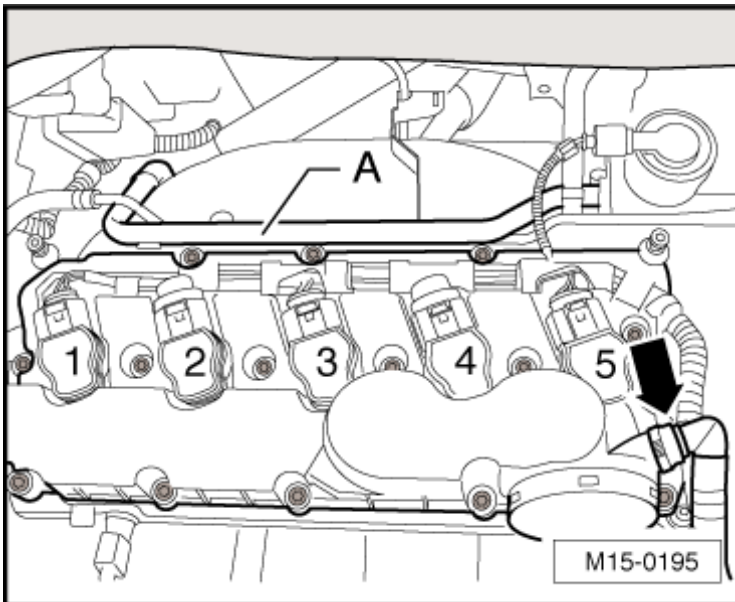


Fig. 20: Identifying Air Hose Of Crankshaft Housing Ventilation
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the Secondary Air Injection (AIR) pipe -A-.
- Remove the ignition coils -1 through 5-. Refer to **IGNITION COILS WITH POWER OUTPUT STAGES** .
- Remove the bolts for the cylinder head cover in sequence -16 through 1-.

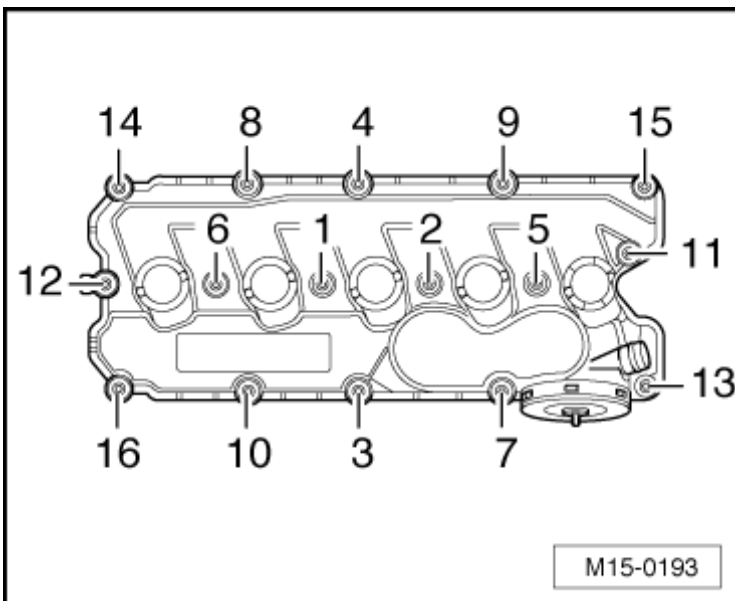


Fig. 21: Identifying Cylinder Head Cover Bolt Removal Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Installing

Install in reverse order of removal. When doing this note the following:

NOTE: Replace the cylinder head cover if damaged or leaking.

-- Clean the sealing surfaces so they are completely free of any oil or grease.

-- Tighten the cylinder head cover bolts in sequence -1 through 16-.

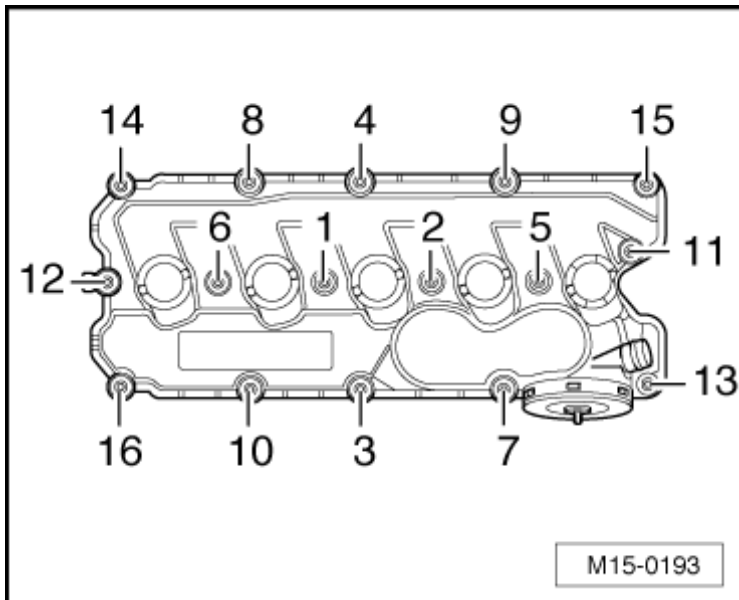


Fig. 22: Identifying Cylinder Head Cover Bolt Removal Sequence

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Observe the tightening sequence when installing the AIR pipe -A-. Refer to **Fig. 23**.

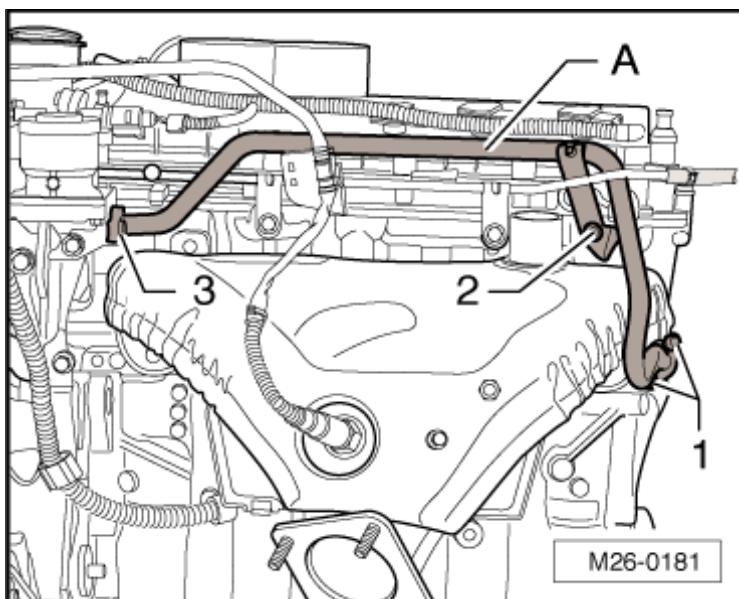


Fig. 23: Identifying Connecting Tube - Tightening Sequence
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

| Component | Nm |
|---|----|
| Cylinder head cover to cylinder head | 10 |
| Secondary air injection pipe to cylinder head | 10 |

CHAIN COMPARTMENT COVER

Special tools and workshop equipment required

- Trim Removal Wedge 3409
- Torque Wrench (5-50 Nm) V.A.G 1331
- Hand Drill with Plastic Brush Attachment
- Protective Eyewear
- Silicone sealant D 174 003 A2

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- Route lines of all types (for example, fuel, hydraulic, Evaporative Emission (EVAP), coolant, refrigerant, brake fluid and vacuum) and electrical wiring so that the original path is followed.
- To prevent damage to the lines, make sure there is sufficient clearance to all moving or hot components.

Removing

- Remove the engine cover with air filter. Refer to ENGINE COVER WITH AIR FILTER .
- Remove the battery and the battery tray. Refer to Removal and Installation .

WARNING: Hot steam may escape when opening the expansion tank cap.

- Wear protective goggles and protective clothing to prevent damage to eyes and scalding.
- Cover the cap with a cloth and open very carefully.

-- Drain the coolant, refer to one of the following:

- Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10, refer to **DRAINING AND FILLING** .

-- Remove the intake manifold. Refer to **INTAKE MANIFOLD** .

-- Remove the coolant pipe from the coolant thermostat housing and at the bracket for the vacuum pump.

-- Pull out the circlip -arrow- and remove the coolant line -A-.

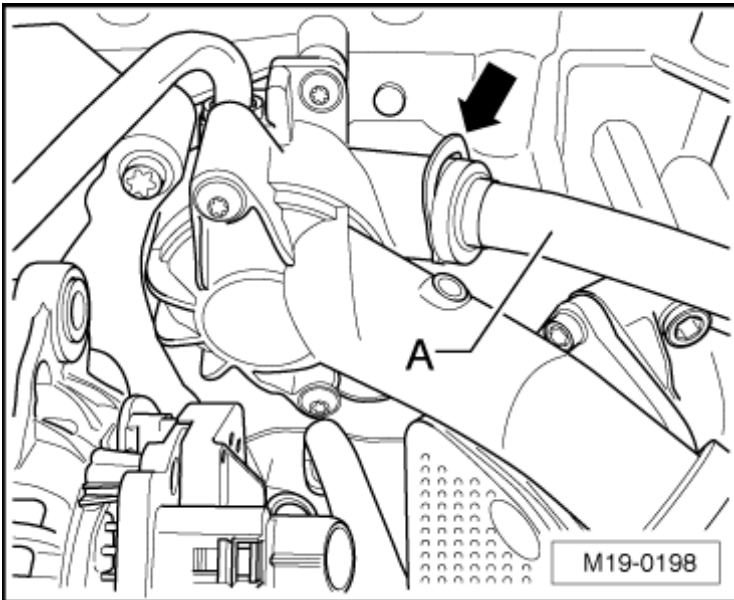


Fig. 24: Identifying Retaining Clip And Coolant Pipe
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Disconnect the connectors -1 and 3-.

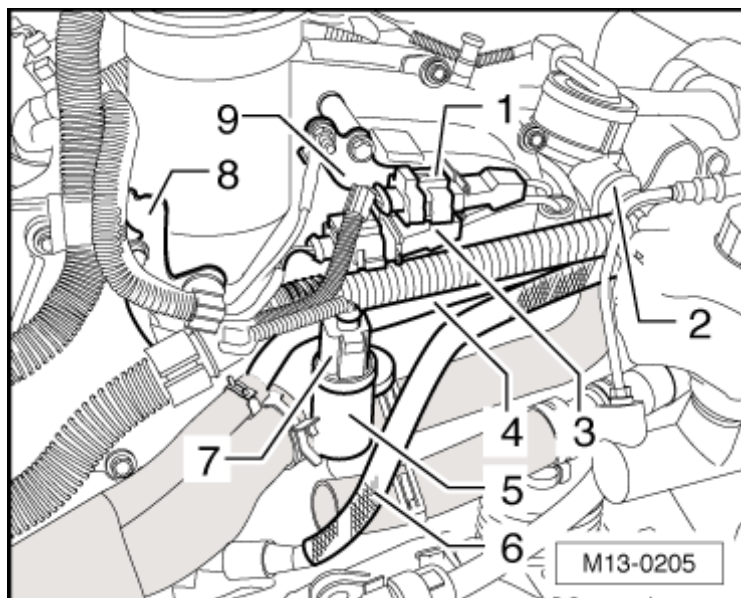


Fig. 25: Identifying Vacuum Hose Disconnected From Vacuum Pump And Connector
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Disconnect the pressure tube -2- from the Secondary Air Injection (AIR) valve.
- Remove rear coolant pipe -4-.
- Disconnect the vacuum hose -6- from the vacuum pump and disconnect the connector -7-.
- Remove the brackets -8 and 9- and set the wiring harness with vent hose aside.
- Press the bracket for the knock sensor wiring harness at the AIR valve slightly toward the rear.
- Remove the coolant thermostat housing -5- and set it aside with the coolant hoses connected.
- Remove all the bolts for the chain compartment cover.
- Pry off the chain compartment cover -1- uniformly from the cylinder head -2- at the top and bottom recesses.

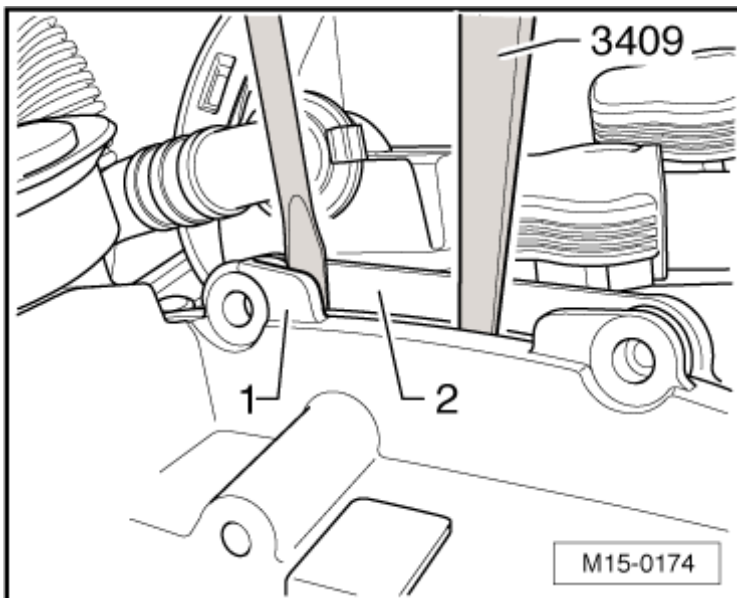


Fig. 26: Identifying Chain Case Cover Pressed Off Uniformly From Cylinder Head At Top And Bottom Recesses

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The sealing surfaces must not be damaged under any circumstances. If necessary, use the trim removal wedge 3409.

After removing the chain compartment cover, clean the trim removal wedge 3409 which is intended for the removal of interior equipment parts.

Installing

WARNING: To prevent injuries from shavings, wear protective goggles and protective clothing.

-- Remove the remainder of the sealant from the chain compartment cover and from the cylinder head, for example, using a rotating plastic brush.

CAUTION: Make sure that no sealant residue enters the engine.

-- Clean the adapter on the cylinder head. If necessary, remove coolant deposits using a copper wire brush or using fine sandpaper (minimum 100 grit). If the pipe connection is worn, replace it using liquid locking fluid D 000 600 A2.

-- Replace the seal in the chain compartment cover. Refer to **CHAIN COMPARTMENT COVER SEAL**.

-- Replace the seal in the coolant thermostat housing.

- Clean the sealing surfaces so they are completely free of any oil or grease.
- Cut the sealant tube nozzle at the front mark (nozzle diameter: approximately 1 mm).

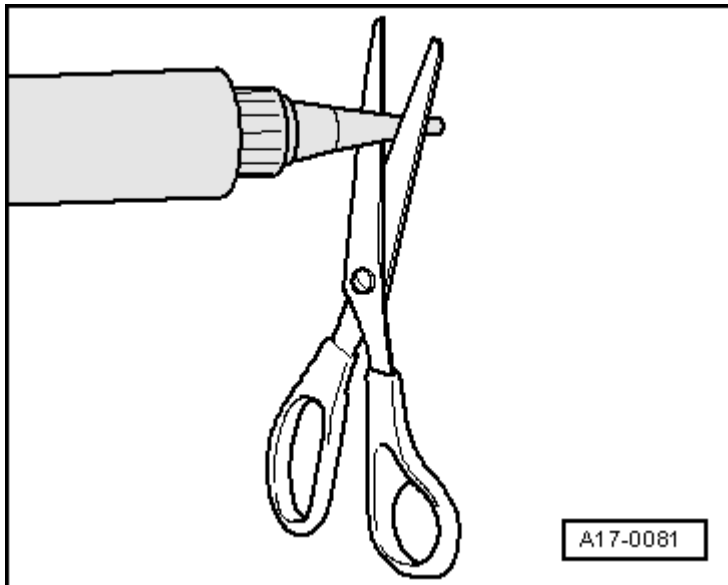


Fig. 27: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 3 Mm)
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The chain compartment cover must be installed within 5 minutes after application of the sealant.

- Apply the sealant bead -A- as shown onto the clean sealing surface of the chain compartment cover.

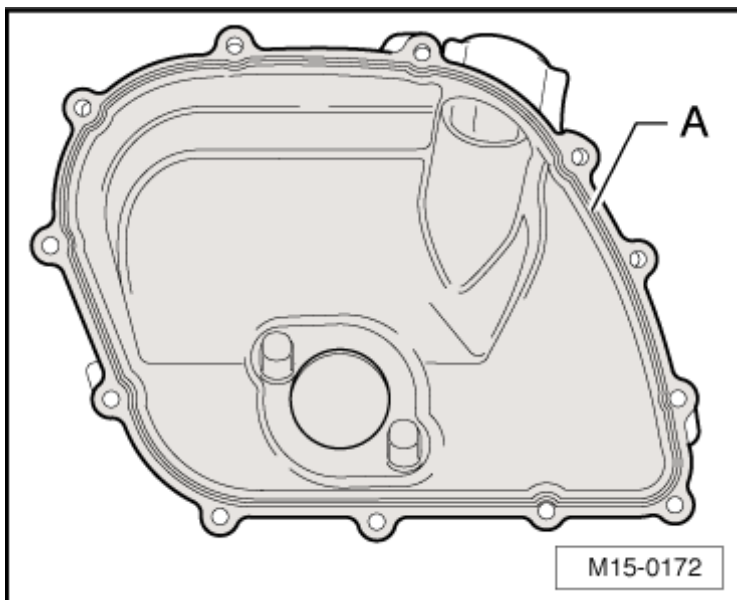


Fig. 28: Identifying Sealant Bead Applied As Depicted To Clean Sealing Surface Of Chain Case Cover
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

2013 Volkswagen Jetta SE

ENGINE 2.5 Liter - Cylinder Head, Valvetrain - Engine Code(s): CBUA (SportWagen)

- The sealant bead must be 1.5 to 2.0 mm thick.

-- Lubricate the seal for the chain compartment cover lightly with engine oil and slide the chain compartment cover onto the pipe connection.

-- Install all the bolts and tighten them in a diagonal sequence.

The rest of the installation follows the reverse of the removal procedures. When doing this note the following:

-- Fill with coolant, refer to one of the following:

- Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10, refer to **DRAINING AND FILLING** .

-- Install the battery tray and battery. Refer to **Removal and Installation** .

Tightening Specifications

| Component | Nm |
|---|----|
| Chain compartment cover to cylinder head | 10 |
| Coolant thermostat housing to chain compartment cover | 10 |

CHAIN COMPARTMENT COVER SEAL

Conditions:

- Chain compartment cover is removed

Special tools and workshop equipment required

- Arbor VW 195
- Tube 60 mm Dia. VW 415 A
- Fitting Sleeve 3241/4

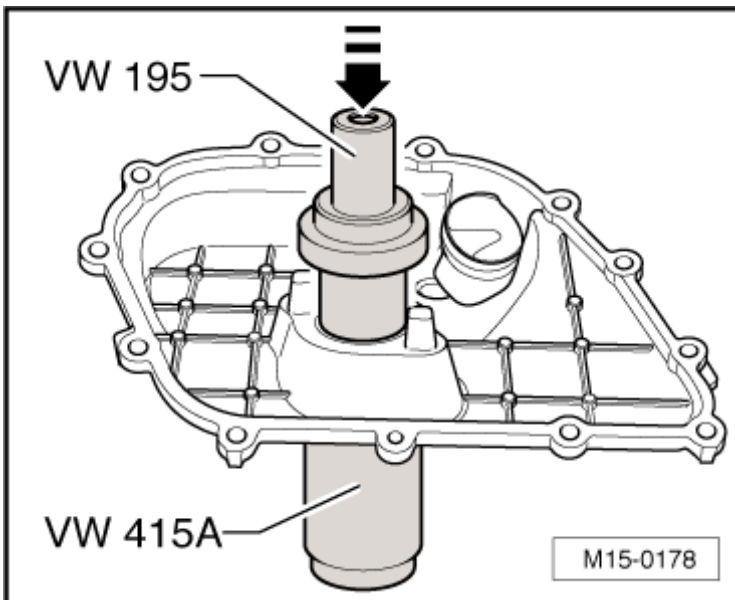


Fig. 29: Identifying Driving Out Sealing Ring
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

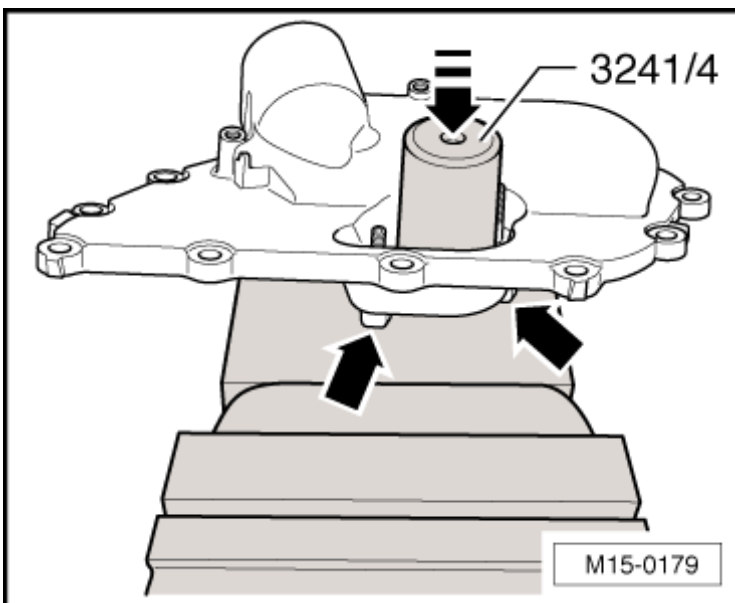


Fig. 30: Identifying Driving In Seal
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Support the chain compartment cover with supports -arrows- on a firm surface and press in the new seal until its seated.

CYLINDER HEAD

Special tools and workshop equipment required

- Drip Tray V.A.G 1306 or VAS 6208

- Torque Wrench (5-50 Nm) V.A.G 1331
- Torque Wrench (40-200 Nm) V.A.G 1332
- Spring Type Clip Pliers VAS 5024 A
- Polydrive Bit and Drive Socket T10070 or 3452
- Ignition Coil Puller T40039
- Silicone Sealant D 174 003 A2

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- Route lines of all types (for example, fuel, hydraulic, Evaporative Emission (EVAP), coolant, refrigerant, brake fluid and vacuum) and electrical wiring so that the original path is followed.
- To prevent damage to the lines, make sure there is sufficient clearance to all moving or hot components.

Removing

-- Drain the coolant, refer to one of the following:

- Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10, refer to **DRAINING AND FILLING** .

-- Remove the engine cover with air filter. Refer to **ENGINE COVER WITH AIR FILTER** .

-- Remove the battery and the battery tray. Refer to **Removal and Installation** .

WARNING: Hot steam may escape when opening the expansion tank cap.

- Wear protective goggles and protective clothing to prevent damage to eyes and scalding.
- Cover the cap with a cloth and open very carefully.

-- Remove the intake manifold. Refer to **INTAKE MANIFOLD** .

-- Install the transport strap to the cylinder head again in order to better hold the cylinder head during removal.

-- Remove the chain compartment cover. Refer to **CHAIN COMPARTMENT COVER**.

-- Remove the cylinder head cover. Refer to **CYLINDER HEAD COVER**.

-- Lock the camshafts and remove the adjuster and sprocket from the camshafts. Refer to **VALVE TIMING, ADJUSTING**.

-- Hold the timing chain -A- as shown to be able to lay it under the adapter -arrow-.

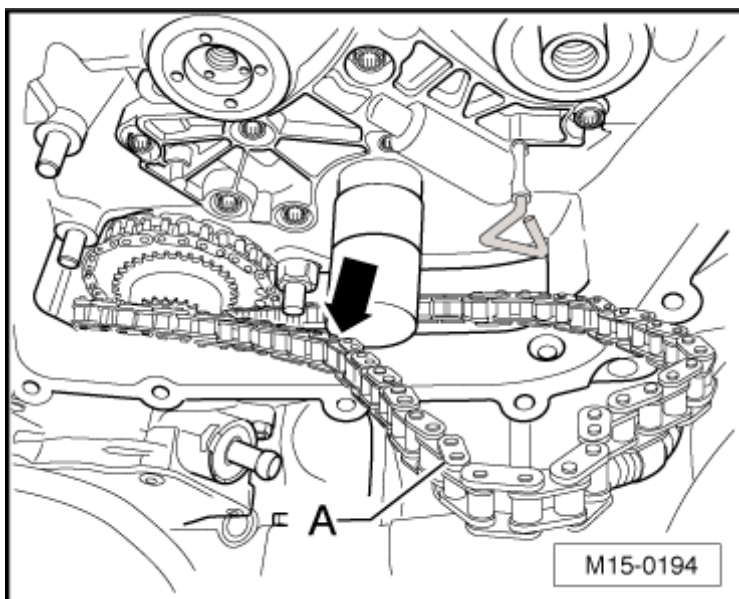


Fig. 31: Identifying Timing Chain Held To Lay It Under Pipe Connection
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the 4 exhaust manifold to front exhaust pipe nuts -2- and the exhaust system suspended mount bolts -3-.

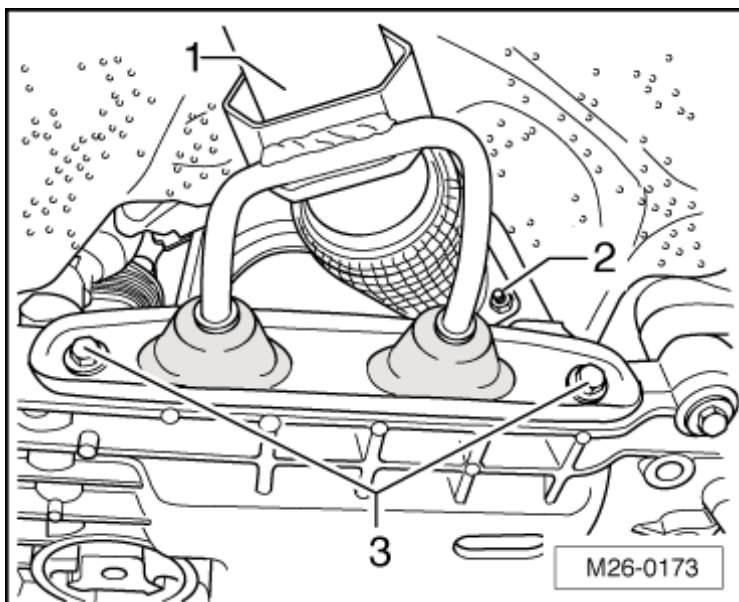


Fig. 32: Identifying Nuts, Bolts & Front Exhaust Pipe
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the front exhaust pipe -1- from the manifold and secure it firmly to the side. Refer to **FRONT EXHAUST PIPE WITH CATALYTIC CONVERTER**.

NOTE: The flex joint in the front exhaust pipe must not be bent more than 10 °, otherwise it may be damaged.

-- Disconnect the harness connector for the heated oxygen sensor -G39- at the bulkhead.

-- Remove the wire bracket -3- bolts -arrows- at the Secondary Air Injection (AIR) valve or sealing cap (engines without a AIR system).

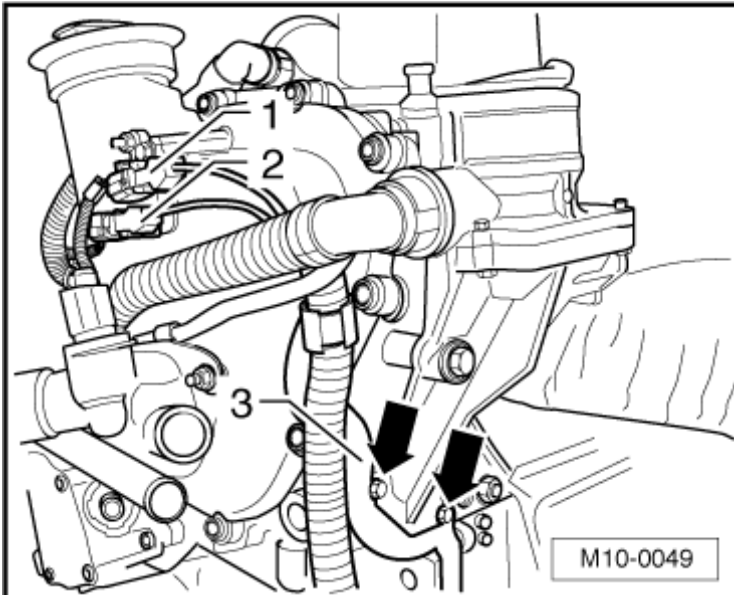


Fig. 33: Identifying Harness Connectors To Disconnect And Remove Bracket
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the cylinder head bolts in the sequence specified.

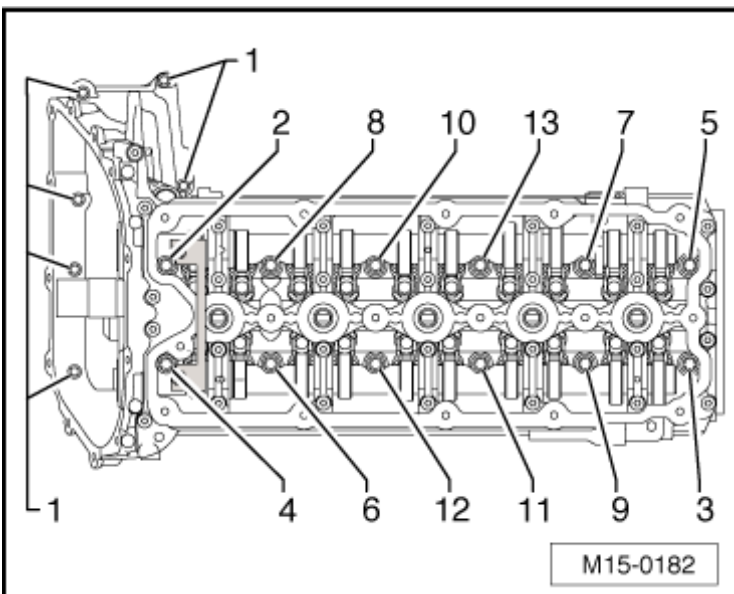


Fig. 34: Identifying Cylinder Head Bolts Removed In Sequence Specified

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: If the bolt -2- was not able to be pulled out using a magnet, loosen the bolts for the camshaft clamp T40070 one rotation, slide the camshaft clamp T40070 toward the right front (seen in direction of travel) and tighten the bolts again.

A second mechanic is required to remove and install the cylinder head.

-- Carefully remove the cylinder head.

Installing

NOTE: There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.

Only remove the new cylinder head gasket from its packaging immediately before installing.

Handle the new gasket with extreme care. Damaging will lead to leaks.

Replace the cylinder head bolts.

-- Insert clean cloths into the cylinders and chain compartment so that no dirt or abrasive powder can penetrate between the cylinder wall and piston and into the chain compartment.

-- Do not allow dirt or abrasive powder to get into the coolant either.

-- Carefully clean the cylinder head and cylinder block sealing surfaces. Avoid introducing scratches or scoring (do not use sandpaper with grit below 100).

-- Carefully remove any metal particles, emery remains and the cloths.

-- Cut the sealant tube nozzle at the front mark (nozzle diameter: approximately 1 mm).

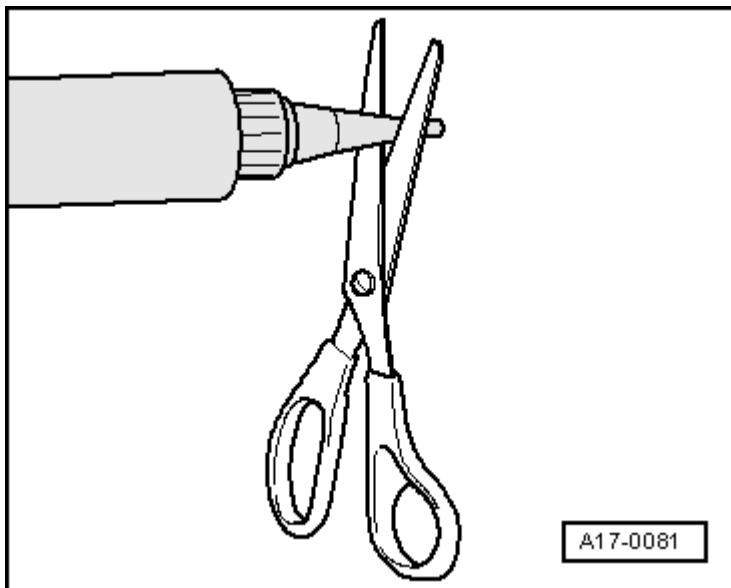


Fig. 35: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 3 Mm)
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Note the shelf life date.

-- Apply a bead of sealant -1- (front and rear) onto the clean sealing surfaces as illustrated.

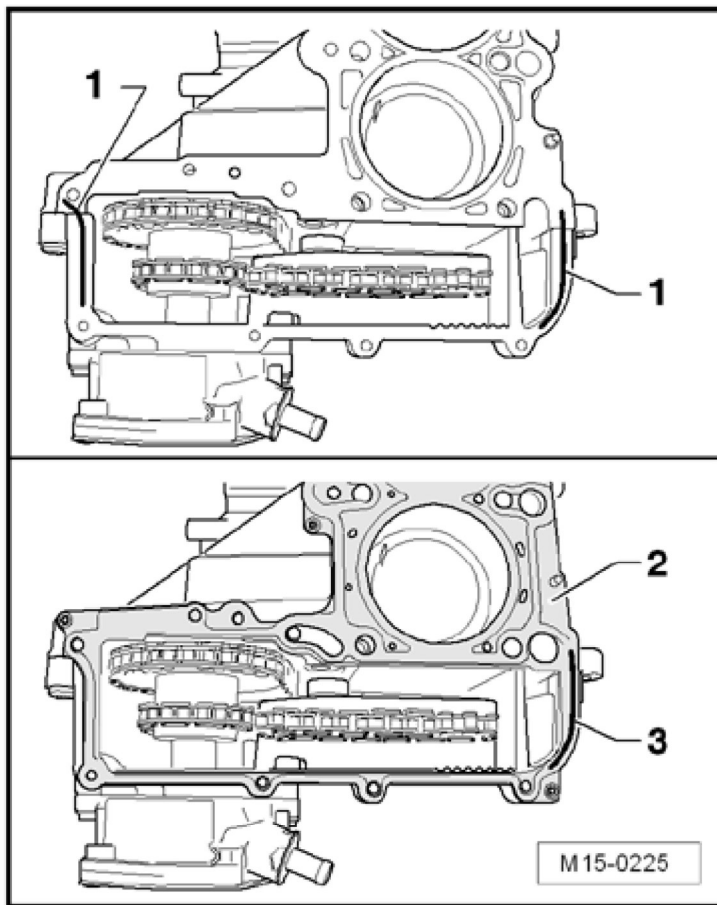


Fig. 36: Identifying Sealant Bead Locations

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- The sealant bead must be 2.0 to 2.5 mm thick.

-- Install the new cylinder head gasket -2-.

-- Note the alignment sleeves in the cylinder block -arrows-.

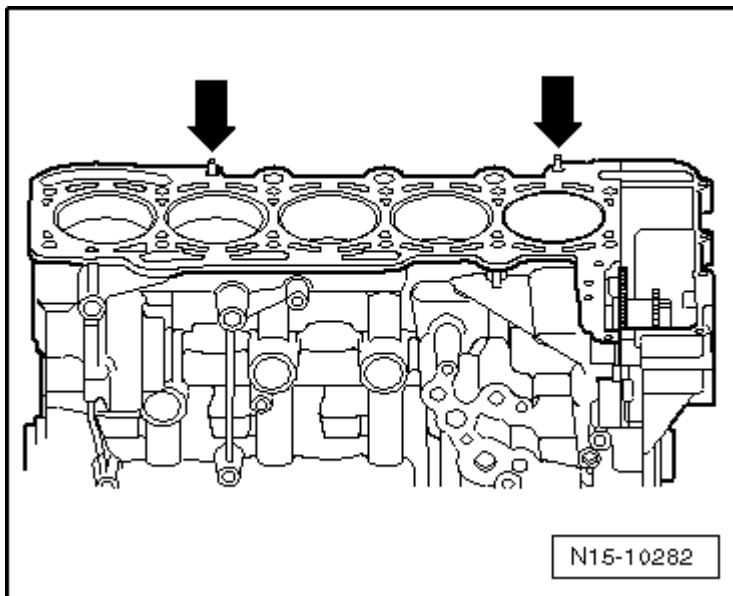


Fig. 37: Identifying Centering Pins In Cylinder Block
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Apply a bead of sealant -3- (rear only), as illustrated, onto the cylinder head gasket.

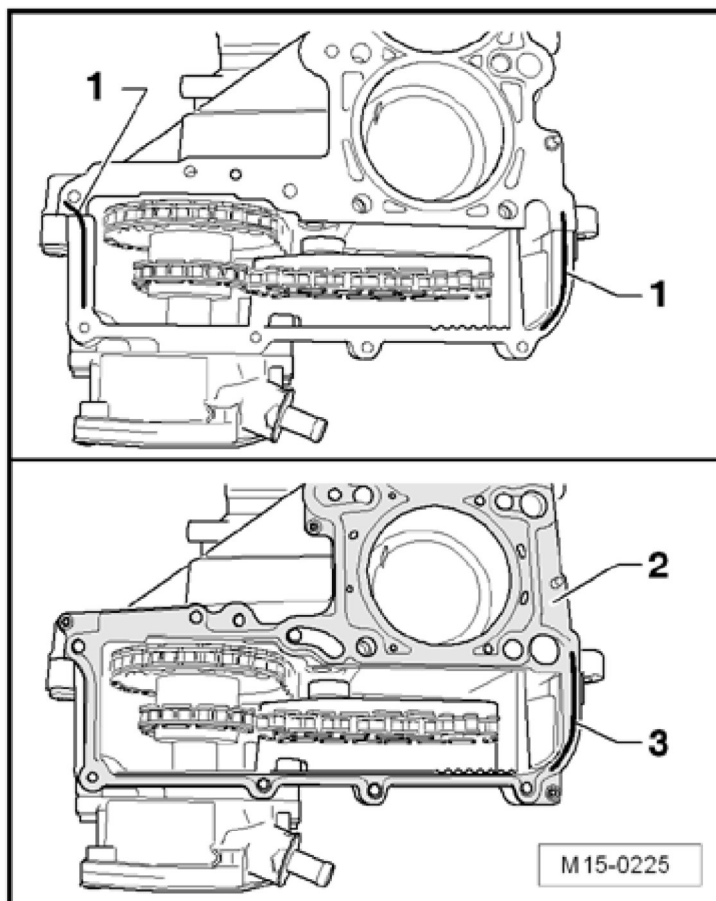


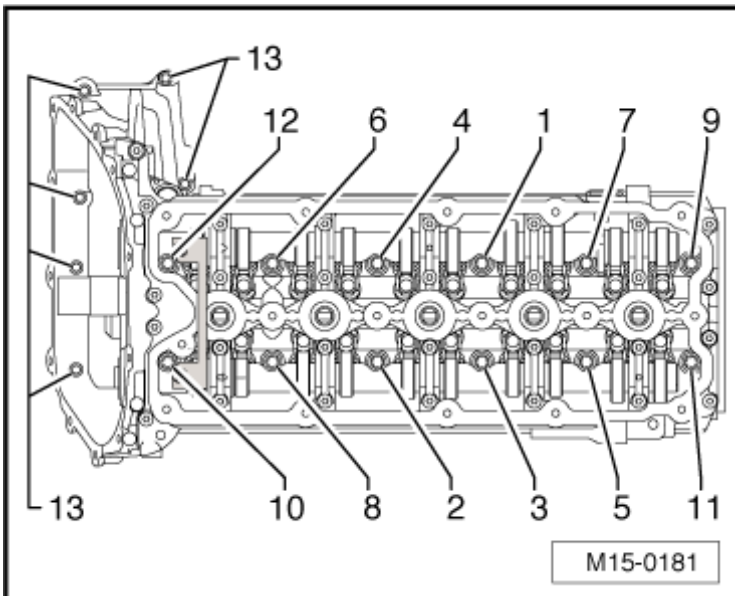
Fig. 38: Identifying Sealant Bead Locations

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- The sealant bead must be 2.0 to 2.5 mm thick.

NOTE: The cylinder head must be installed within 5 minutes of being applied with sealant.

- Install the cylinder head.
- Guide the timing chain over the adapter.
- Install the cylinder head bolts and tighten them hand tight.
- Then, tighten the cylinder head bolts -1 through 12- in the sequence shown as follows:

**Fig. 39: Identifying Cylinder Head Bolts Tightening Sequence**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

| Step | Tighten |
|------|---|
| 1 | -- Using a torque wrench, tighten the bolts to 40 Nm. |
| 2 | -- Using a ratchet, tighten the bolts an additional 90° (1/4) turn. |
| 3 | -- Using a ratchet, tighten the bolts an additional 90° (1/4) turn. |

- Then, tighten the bolts -13- to 10 Nm.
- Wipe off any sealant, which has leaked out.

The rest of the installation follows the reverse of the removal procedures. When doing this note the following:

-- Remove the locking pin T40069 from the rear of the cylinder block and install the locking bolt.

-- Install the battery tray and battery. Refer to **Removal and Installation** .

-- Fill with new coolant. Refer to one of the following:

- Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10, refer to **DRAINING AND FILLING** .

VALVE STEM SEALS

(With the cylinder head installed)

Special tools and workshop equipment required

- Spark Plug Removal Tool 3122 B
- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Adapter T40012
- Torque Wrench (5-50 Nm) V.A.G 1331
- Valve Cotters Asm/Disasm Device VAS 5161
- Guide Plate for FSI Engine VAS 5161/19B

Removing

To remove the valve stem seals, the following components must be removed as follows:

- Intake valves cylinder 1: Transport strap
- Intake valves cylinder 5: Camshaft adjustment valve 1 -N205-
- Exhaust valves cylinder 5: Secondary air injection solenoid valve -N112-

-- Remove the camshafts. Refer to **CAMSHAFTS**.

-- Remove the roller rocker arm and lay them on a clean surface. Make sure that the rocker arms are not interchanged.

-- Remove the spark plugs using the spark plug removal tool 3122 B.

-- Install the guide plate for FSI engine VAS 5161/19B using the knurled thumb screws M6 VAS 5161/12 to the cylinder head as shown.

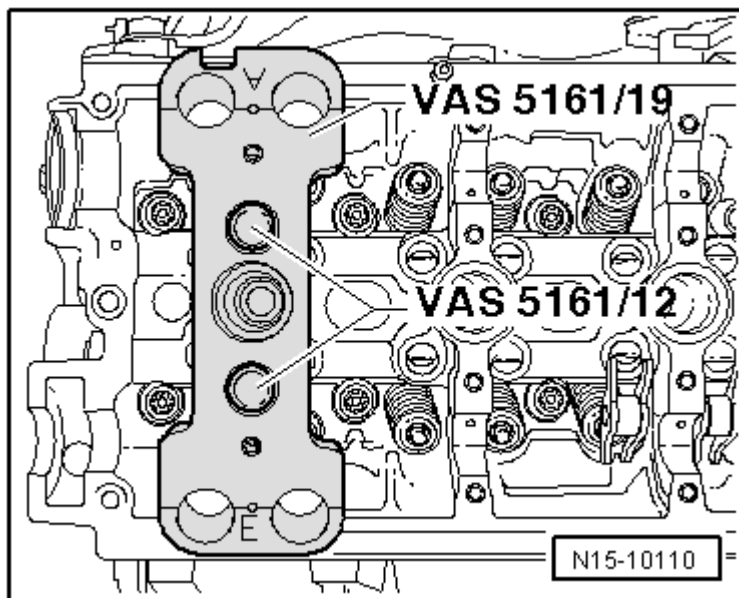


Fig. 40: Identifying Install Guide Plate VAS 5161/19 With Knurled Bolts VAS 5161/12 On Cylinder Head
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Adjust the piston of the respective cylinder to Bottom Dead Center (BDC).
- Install the adapter T40012 into the spark plug hole and connect the compressed air (minimum 6 bar).
- Loosen any stuck valve retainers using the punch VAS 5161/3 and a plastic mallet.

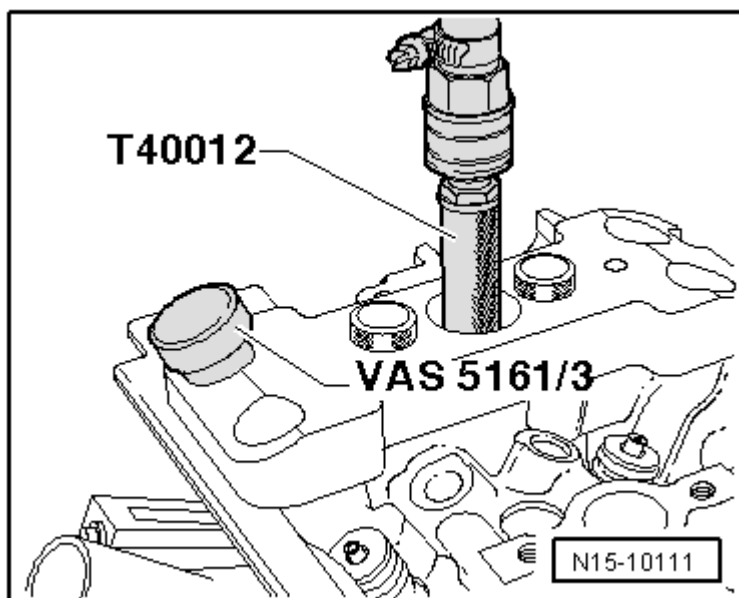


Fig. 41: Identifying Drift VAS 5161/3 And Plastic Mallet T40012 To Loosen Stuck Valve Keepers
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Install the retainer VAS 5161/6 with the guide forks M6/M8 with threaded studs VAS 5161/5 into the guide plate for FSI engine VAS 5161/19B.

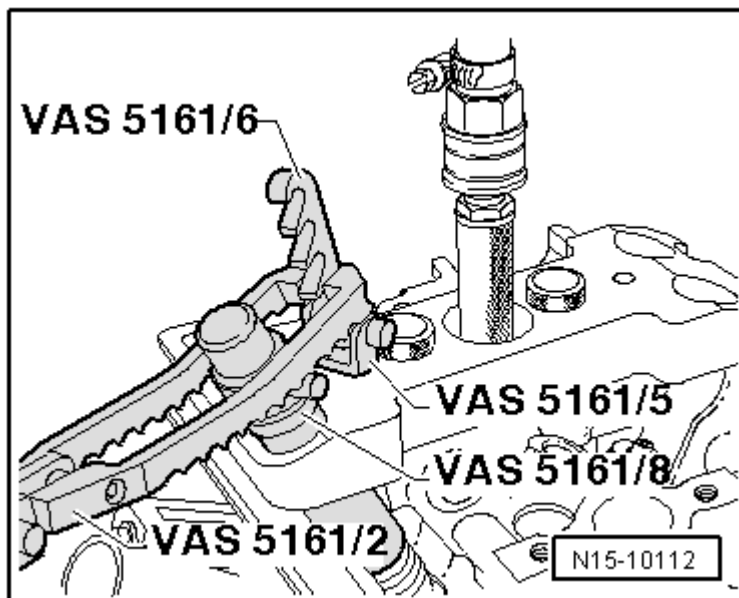


Fig. 42: Identifying Engaging Device VAS 5161/6 With Installation Forks VAS 5161/5 Installed Into Guide Plate VAS 5161/19

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Insert the assembly cartridge VAS 5161/8 into the guide plate for FSI engine VAS 5161/19B.

-- Engage the pressure fork with lever for assembly cartridge VAS 5161/2 on the retainer VAS 5161/6.

NOTE: The pressure fork with lever for assembly cartridge VAS 5161/2 must engage on the exhaust side as illustrated.

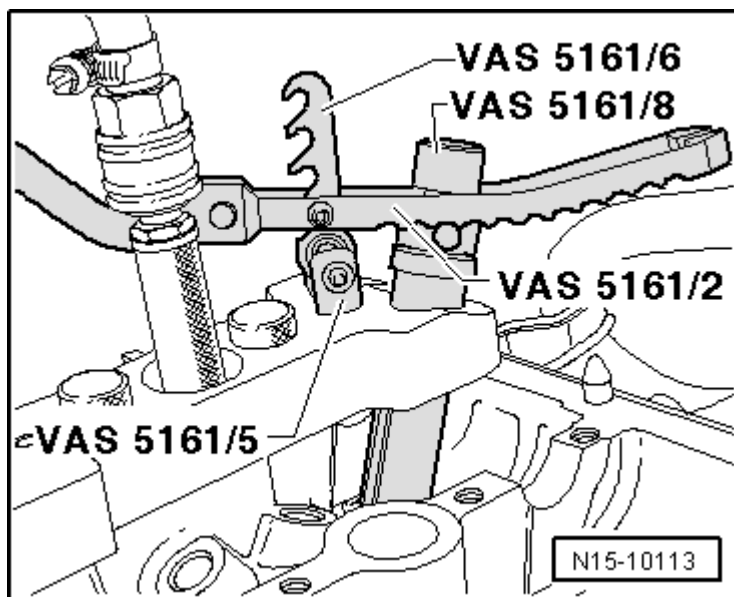


Fig. 43: Identifying Pressure Forks VAS 5161/2 Engaged
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Press down the assembly cartridge VAS 5161/8. At the same time, turn knurled bolt on the assembly cartridge VAS 5161/8 clockwise until the points engage in the valve retainers.
- Lightly move the knurled bolt on the assembly cartridge back and forth, this causes the valve retainers to be pressed apart and captured in the cartridge.
- Release the pressure fork with lever for assembly cartridge VAS 5161/2.
- Remove the assembly cartridge VAS 5161/8, valve spring retainers and valve springs.
- Remove the valve stem seal using the valve seal removal tool 3364.

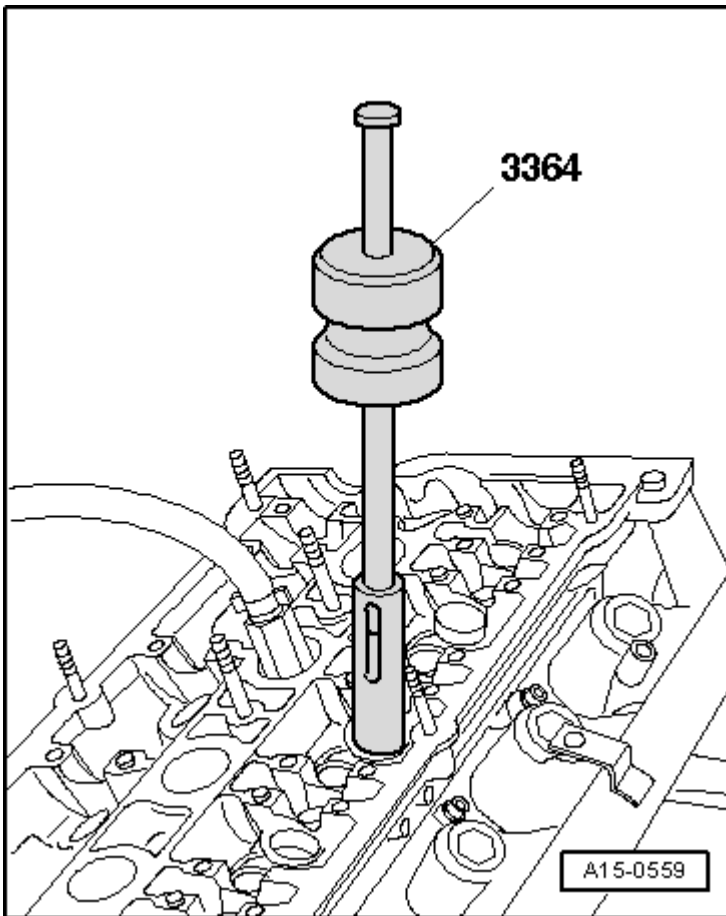


Fig. 44: Identifying Valve Seal Removal Tool 3364
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- In the event the valve seal removal tool 3364 cannot be used due to space constraints, drive the out pin - arrow- using a drift and remove the impact device.

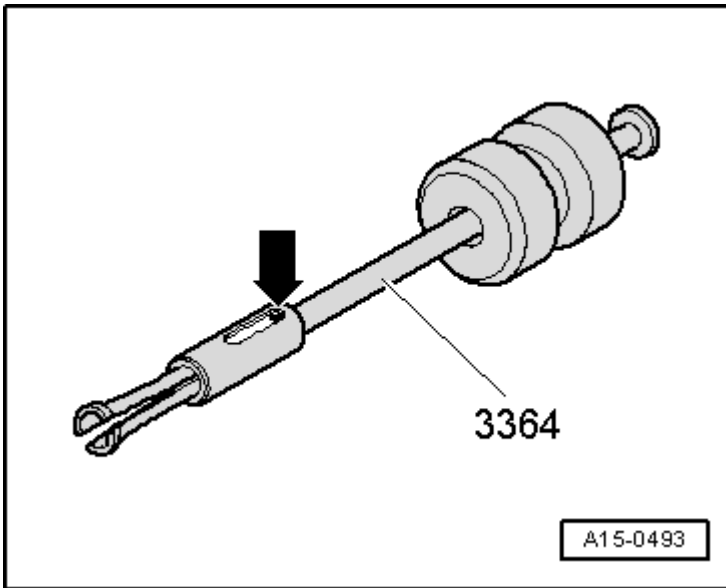


Fig. 45: Identifying Direction To Drive Out Spring Dowel Sleeve
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Place the lower part of the valve seal removal tool 3364 onto the valve stem seal.

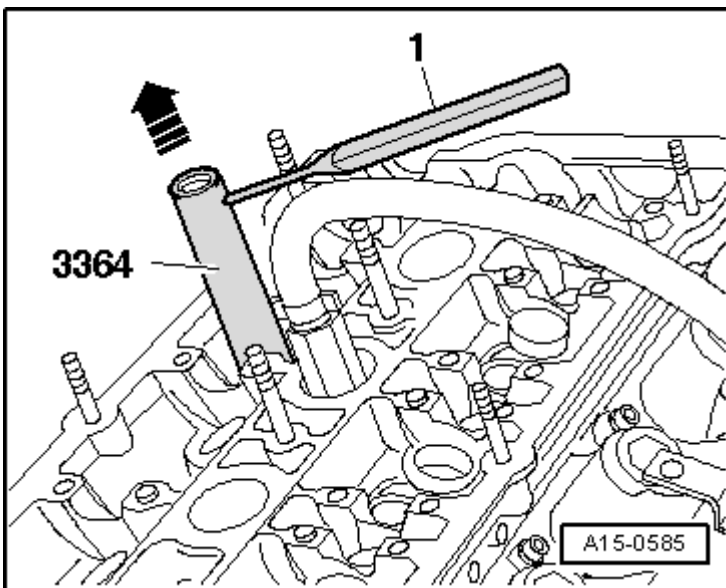


Fig. 46: Identifying Placement Of Lower Part Of Valve Seal Removal Tool 3364 On To Valve Stem Oil Seal

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Insert a drift -1- into the bore in the lower part of the valve seal removal tool.

-- Using the drive -1- as a lever, pull out the valve stem seal -arrow-.

Installing

-- Place the plastic sleeve -A- on the valve stem to prevent damage to the new valve stem seal -B-.

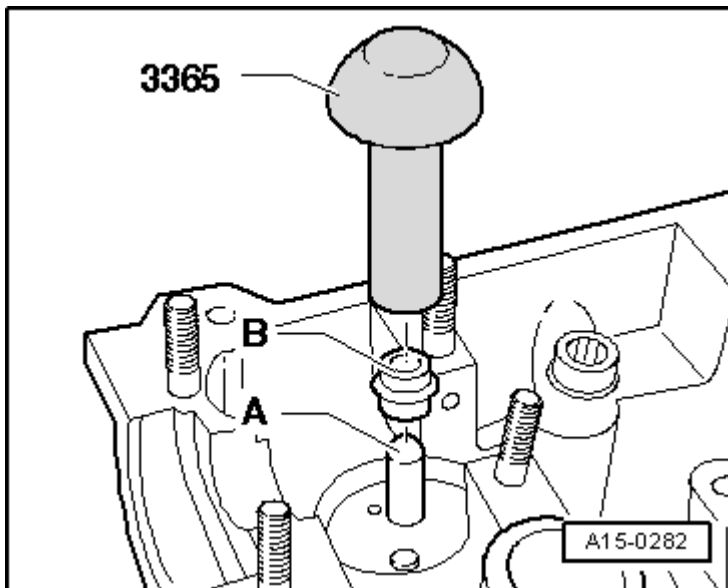


Fig. 47: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Lubricate the sealing lip of the valve stem seal -B-, insert it into the valve stem seal driver 3365 and carefully slide it onto the valve guide.

-- Remove the plastic sleeve -A-.

-- Insert the valve spring and valve spring retainers.

-- Install the valve cotters asm/disasm device VAS 5161 components as shown.

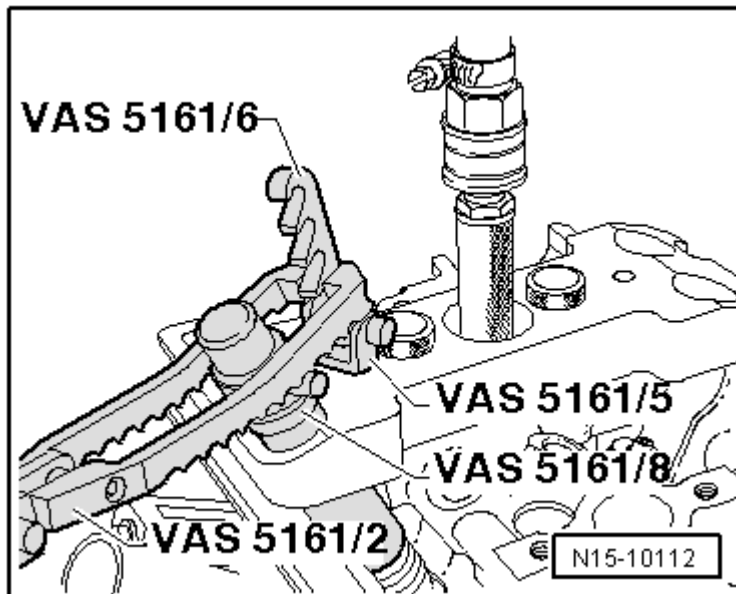


Fig. 48: Identifying Engaging Device VAS 5161/6 With Installation Forks VAS 5161/5 Installed Into Guide Plate VAS 5161/19

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

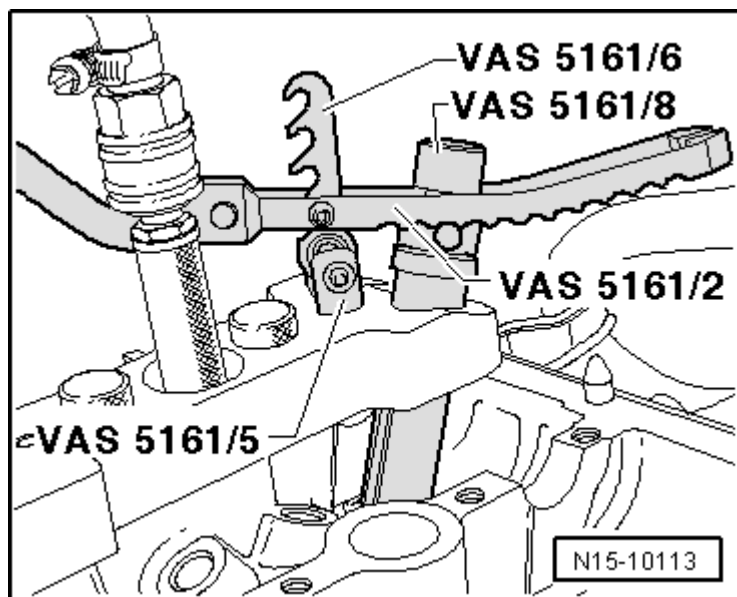


Fig. 49: Identifying Pressure Forks VAS 5161/2 Engaged

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: If the valve retainers were removed from the assembly cartridge, they must be inserted into the valve insertion device VAS 5161/18 next.

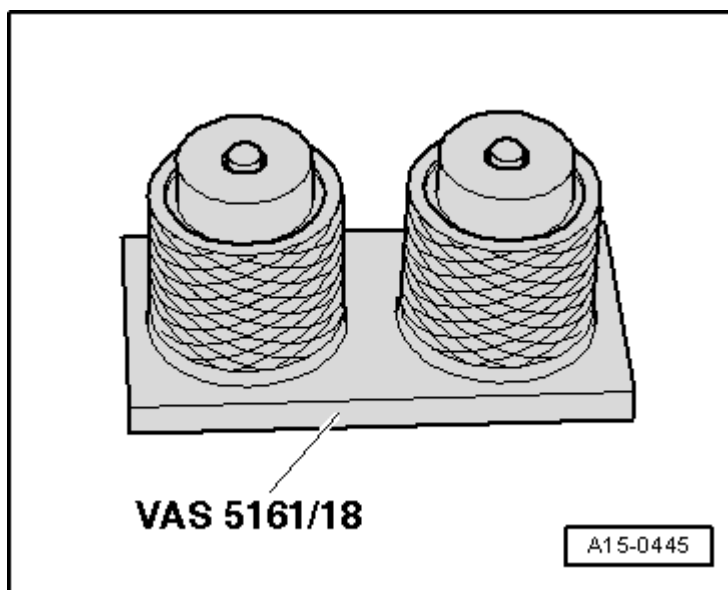


Fig. 50: Identifying Installation Cartridge VAS 5161/8

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Press the assembly cartridge VAS 5161/8 onto the valve insertion device from

above and take up the valve retainers.

-- Press down the assembly cartridge VAS 5161/8 using the pressure fork with lever for assembly cartridge VAS 5161/2, knock lightly against the assembly cartridge in the lower area, rotate the knurled bolt on the assembly cartridge back and forth and pull upward while doing this.

-- Release the pressure fork with lever for assembly cartridge VAS 5161/2 with the knurled bolt pulled.

-- Remove the valve cotters asm/disasm device VAS 5161 components.

The rest of the installation follows the reverse of the removal procedures. When doing this note the following:

-- Remove the locking pin T40069 from the rear of the cylinder block and install the locking bolt.

-- Fill the coolant. Refer to one of the following:

- Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10, refer to **DRAINING AND FILLING** .

CAMSHAFTS

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Hand Drill with Plastic Brush Attachment
- Protective Eyewear
- Sealant D 154 103 A1

Removing

NOTE: **The sealing surfaces on the bottom of the guide frame and on the top of the cylinder head must not be reworked.**

The camshaft bearings are integrated in the cylinder head and in the guide frame. Before removing the guide frame, the adjuster and sprocket must be removed from the camshafts.

If the guide frame was loosened, the sealing plugs must be replaced.

-- Lock the camshafts and remove the adjuster and sprocket from the camshafts. Refer to **VALVE TIMING, ADJUSTING**.

-- Then, remove the camshaft clamp T40070.

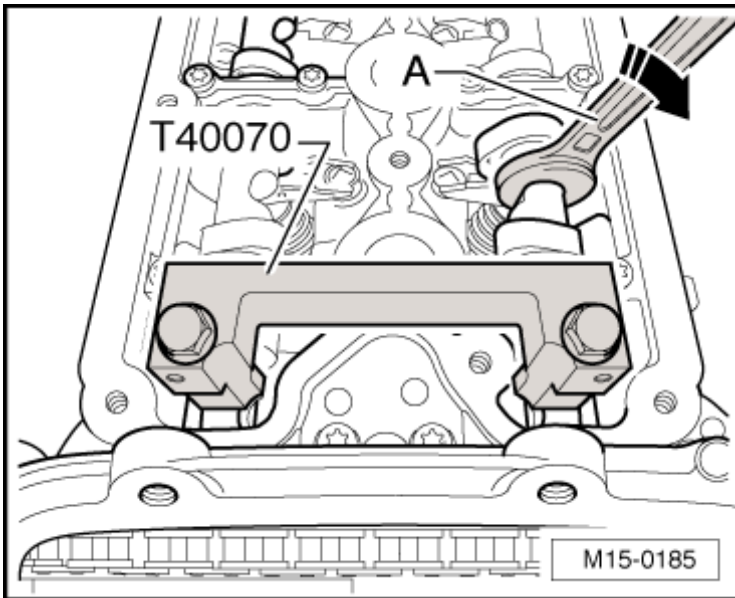


Fig. 51: Identifying Camshaft Clamp T40070 Installed On To Camshafts
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the guide frame bolts evenly working from outside toward the inside and remove the guide frame.
- Carefully remove the camshaft upward and place them on a clean surface.

Installing

WARNING: To prevent injuries from shavings, wear protective goggles and protective clothing.

- Remove any remaining sealant from the guide frame (out of the grooves as well) and from the cylinder head, for example using a rotating plastic brush.

CAUTION: Make sure that no sealant residue enters the engine.

- Clean the sealing surfaces, they must be free of oil and grease.
- Lubricate the journal surfaces of the camshafts.
- Place the guide frame upside down on a soft surface.
- Insert the camshafts correctly into the guide frame.

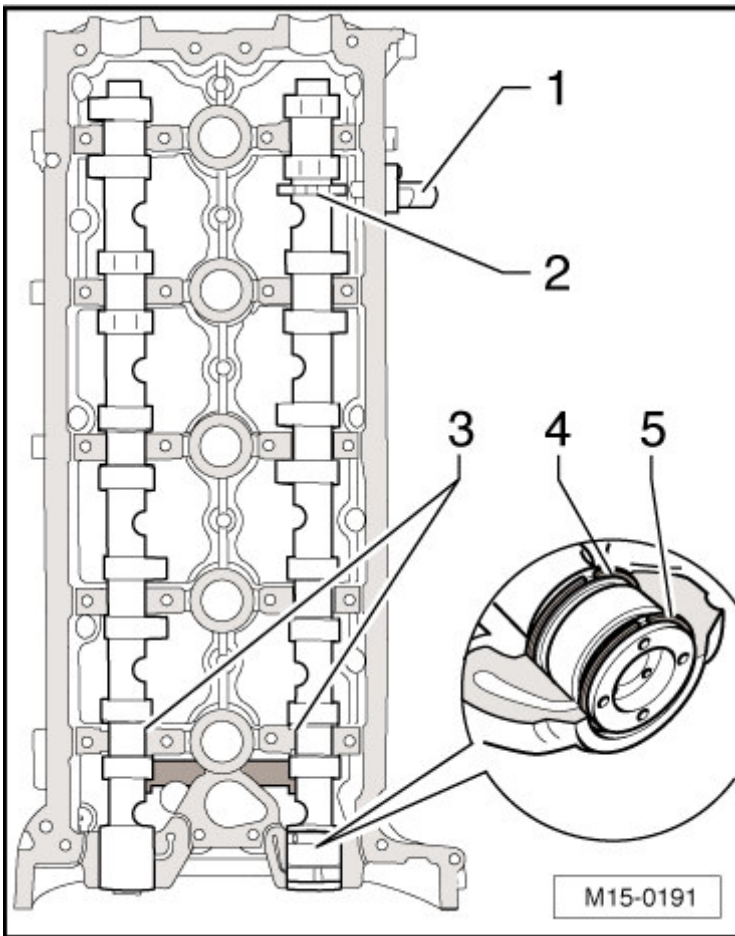
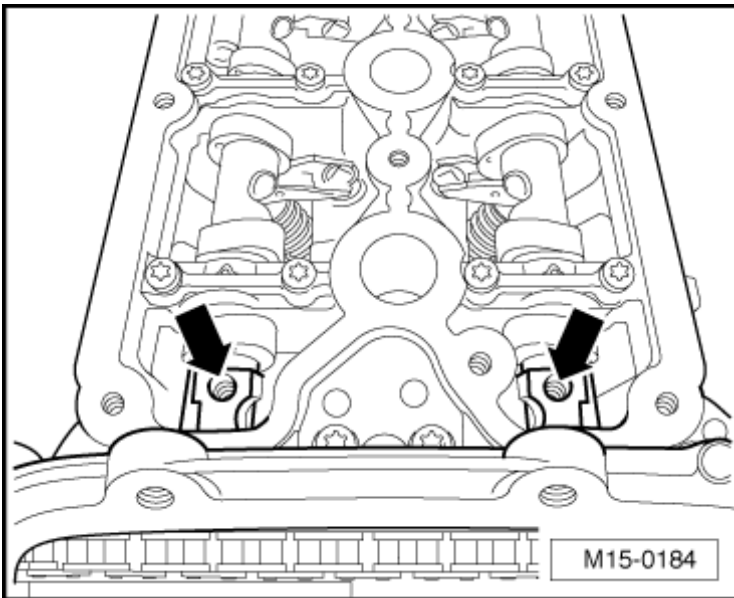


Fig. 52: Identifying Camshafts Inserted Correctly Into Guide Frame
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- The intake camshaft with sensor wheel -2- points toward the camshaft position sensor -G40- -1-.
- The camshafts must lie exactly in the axial bearings -3- of the guide frame.
- The seal ends -4 and 5- must point upward or downward, they must not point to the side under any circumstances.

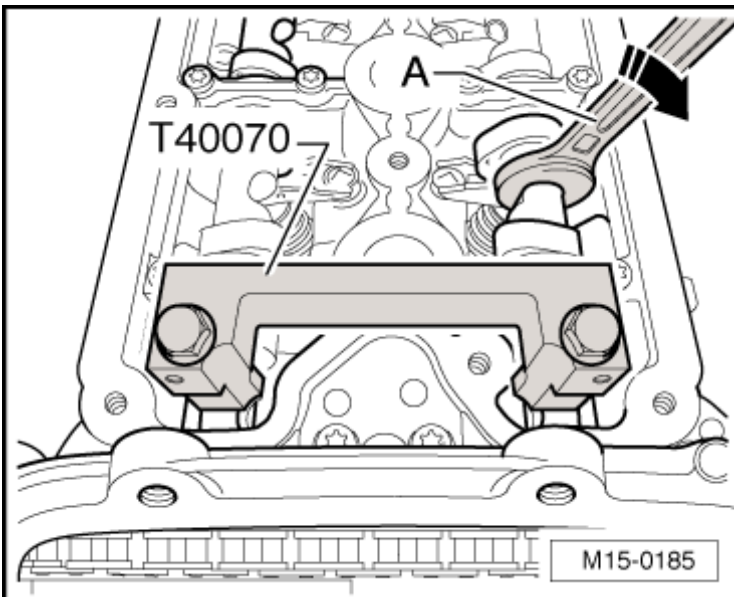
-- Turn the guide frame over, with the camshafts installed, hold the camshafts firmly in place in the guide frame while doing this.

-- Rotate the camshafts until the threaded holes -arrows- point upward.

**Fig. 53: Identifying Threaded Holes**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Check whether the camshafts still lie exactly in the axial bearings in the guide frame.
- Install the camshaft clamp T40070 as shown onto the camshafts and tighten the bolts to 20 Nm.

**Fig. 54: Identifying Camshaft Clamp T40070 Installed On To Camshafts**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Turn over the guide frame again.
- Cut the sealant tube nozzle at the front mark (nozzle diameter: approximately 1 mm).

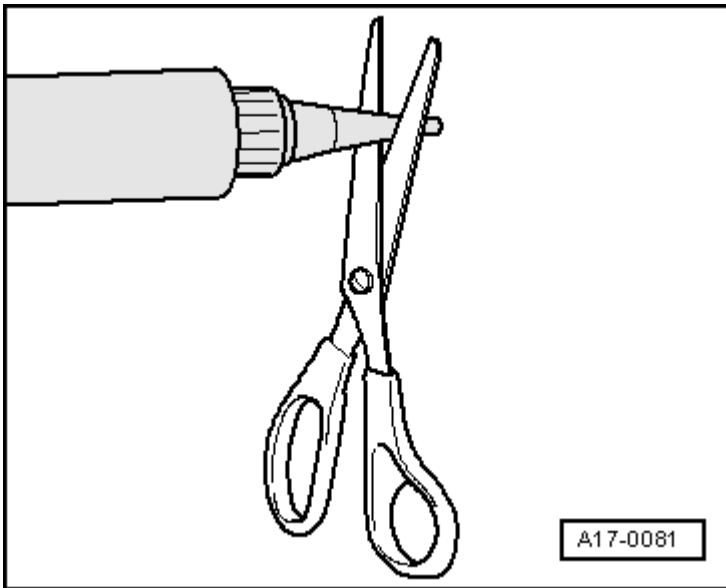


Fig. 55: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 3 Mm)
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Lightly apply an even bead of sealant into the clean grooves -1 through 8- in the guide frame.

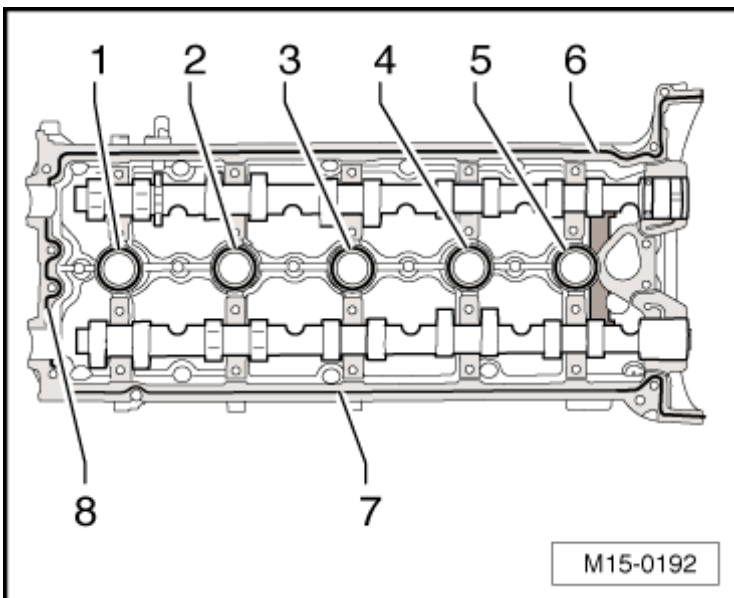


Fig. 56: Identifying Bead Of Sealant Lightly Applied Into Clean Grooves Of Guide Frame
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Width of the sealant bead:

- Grooves -1 through 5- : approximately 3.0 mm
- Grooves -6 through 8- : approximately 4.0 mm

NOTE: The sealant beads must be applied according to exact specifications, otherwise

the excess sealant could get into the camshaft bearings.

Installing and securing the guide frame should be performed without interruption because the sealant begins to harden immediately, as soon as it contacts the sealing surfaces.

Note the expiration date of the sealant.

- Install the guide frame onto the cylinder head immediately.
- Gently tighten the bolts working from the inside towards the outside in several stages.
- Then, tighten the bolts to 8 Nm in the sequence indicated.

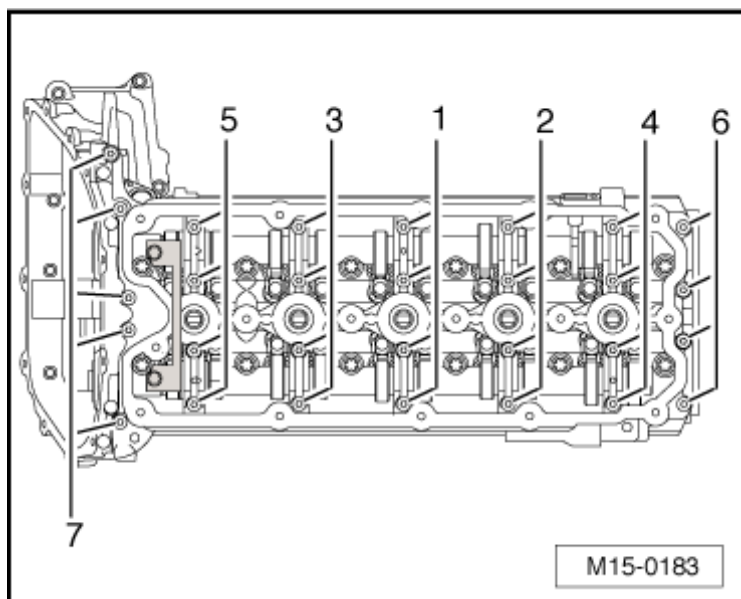


Fig. 57: Identifying Tightening Bolts Sequence

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- After that, continue to tighten all bolts an additional 90° (1/4) turn.
- The sealant must bulge outward slightly, even in the area of the chain compartment -arrows-.

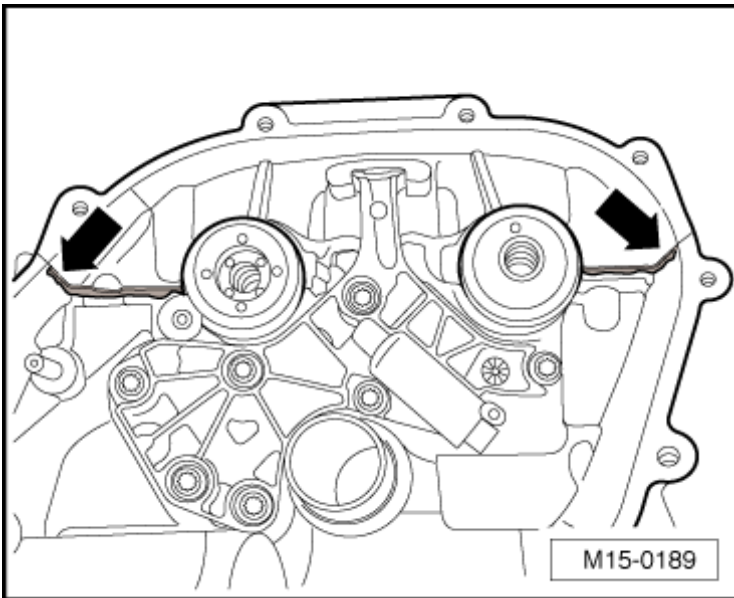


Fig. 58: Identifying Chain Compartment Sealant Locations
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Wipe off the sealant from the sealing surface facing the chain compartment cover.
- Carefully press in the sealing plugs -A- until they reach the end of the chamfer -arrows-.

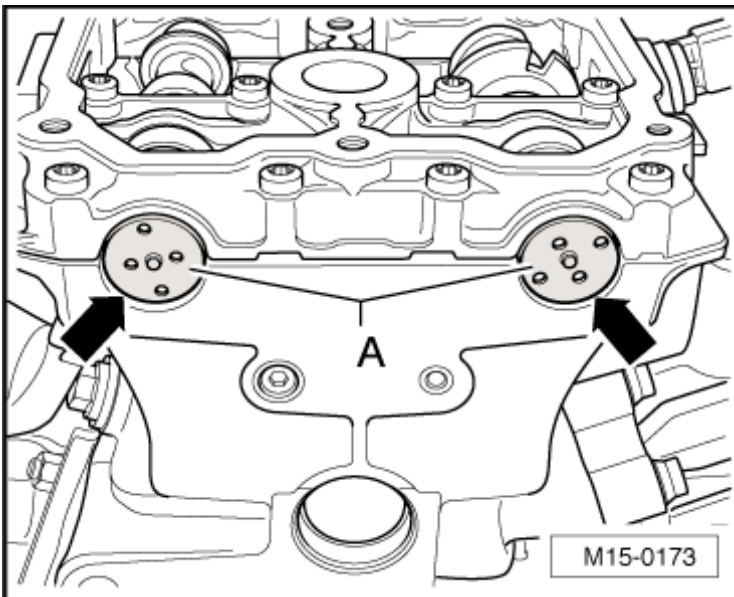


Fig. 59: Identifying Sealing Plugs
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: If the sealing plugs were pressed in too far, it must be pressed through and pressed in again up to the mark.

The rest of the installation follows the reverse of the removal procedures. When doing this note the following:

-- Remove the locking pin T40069 from the rear of the cylinder block and install the locking bolt (30 Nm).

-- Fill the coolant. Refer to one of the following:

- Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10, refer to **DRAINING AND FILLING** .

SPECIAL TOOLS

Special tools and workshop equipment required

- Dial Gauge Holder VW 387
- Spark Plug Removal Tool 3122 B
- Ignition Coil Puller T40039
- Compression Tester V.A.G 1763
- Adapter V.A.G 1381/5A
- Drip Tray V.A.G 1306 or VAS 6208
- Spring Type Clip Pliers VAS 5024 A
- Polydrive Bit and Drive Socket T10070 or 3452
- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Adapter T40012
- Valve Cotters Asm/Disasm Device VAS 5161
- Guide Plate for FSI Engine VAS 5161/19B
- Trim Removal Wedge 3409

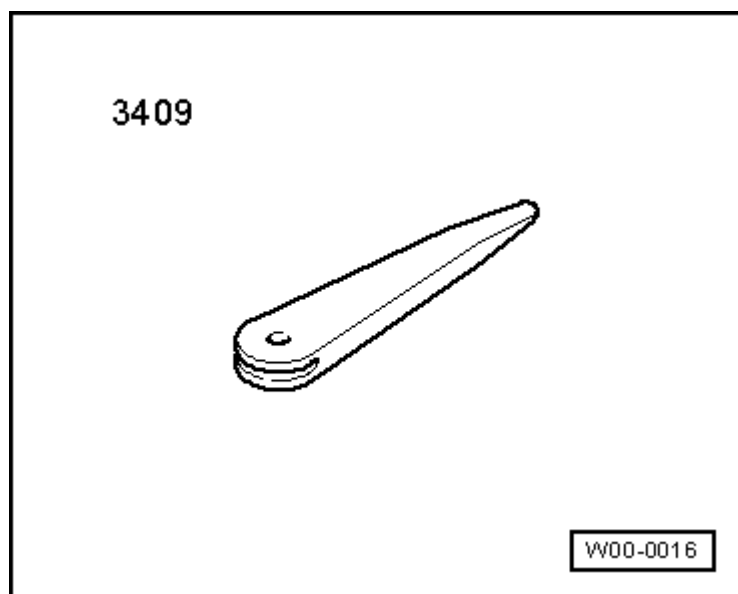


Fig. 60: Identifying 3409 Wedge

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

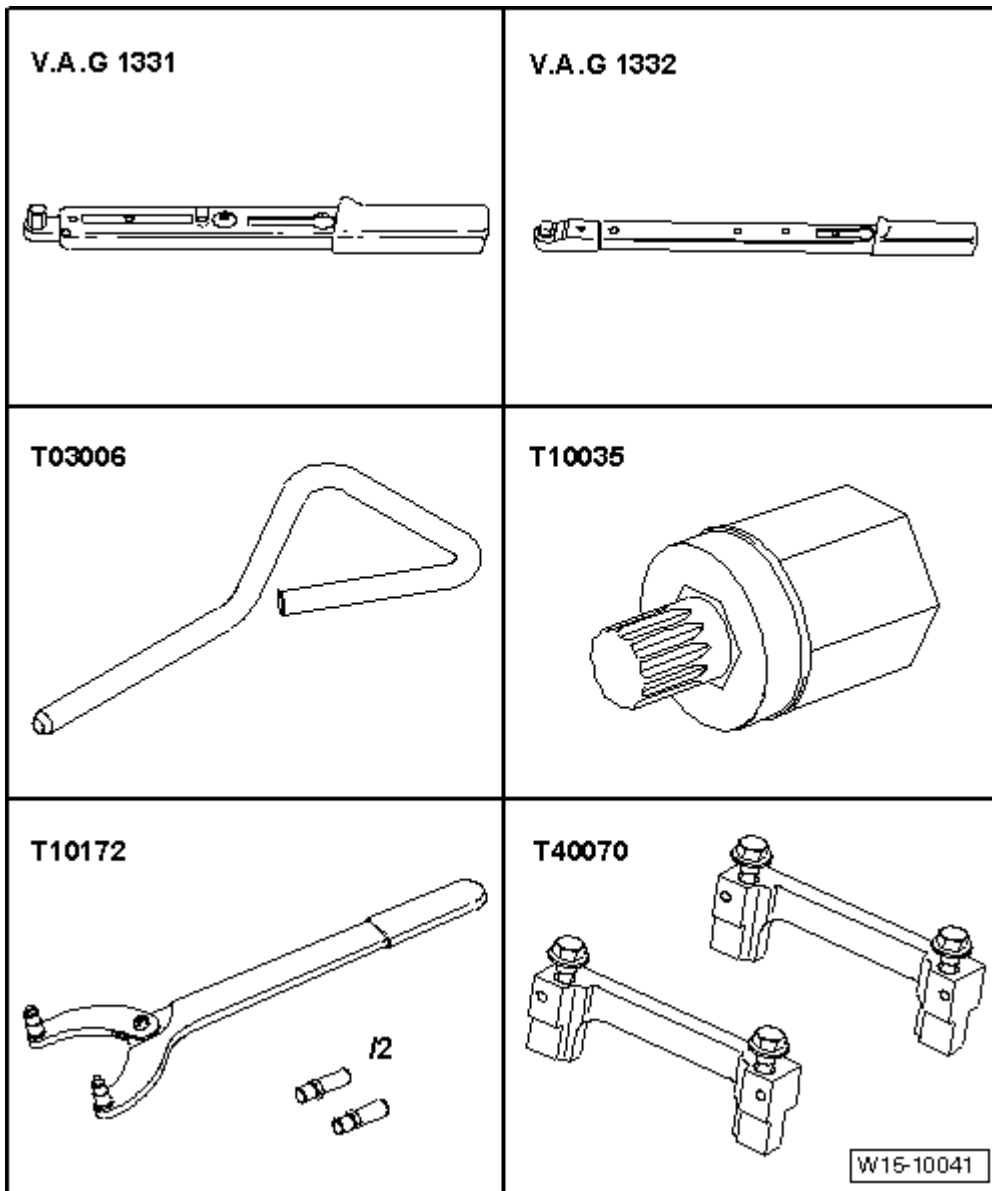


Fig. 61: Identifying Special Tools -- Valve Timing, Adjusting
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Torque Wrench (40-200 Nm) V.A.G 1332
- Locking Pins T03006
- Multipoint Socket T10035
- Counterhold Tool Touareg V10 T10172
- Camshaft Clamp T40070

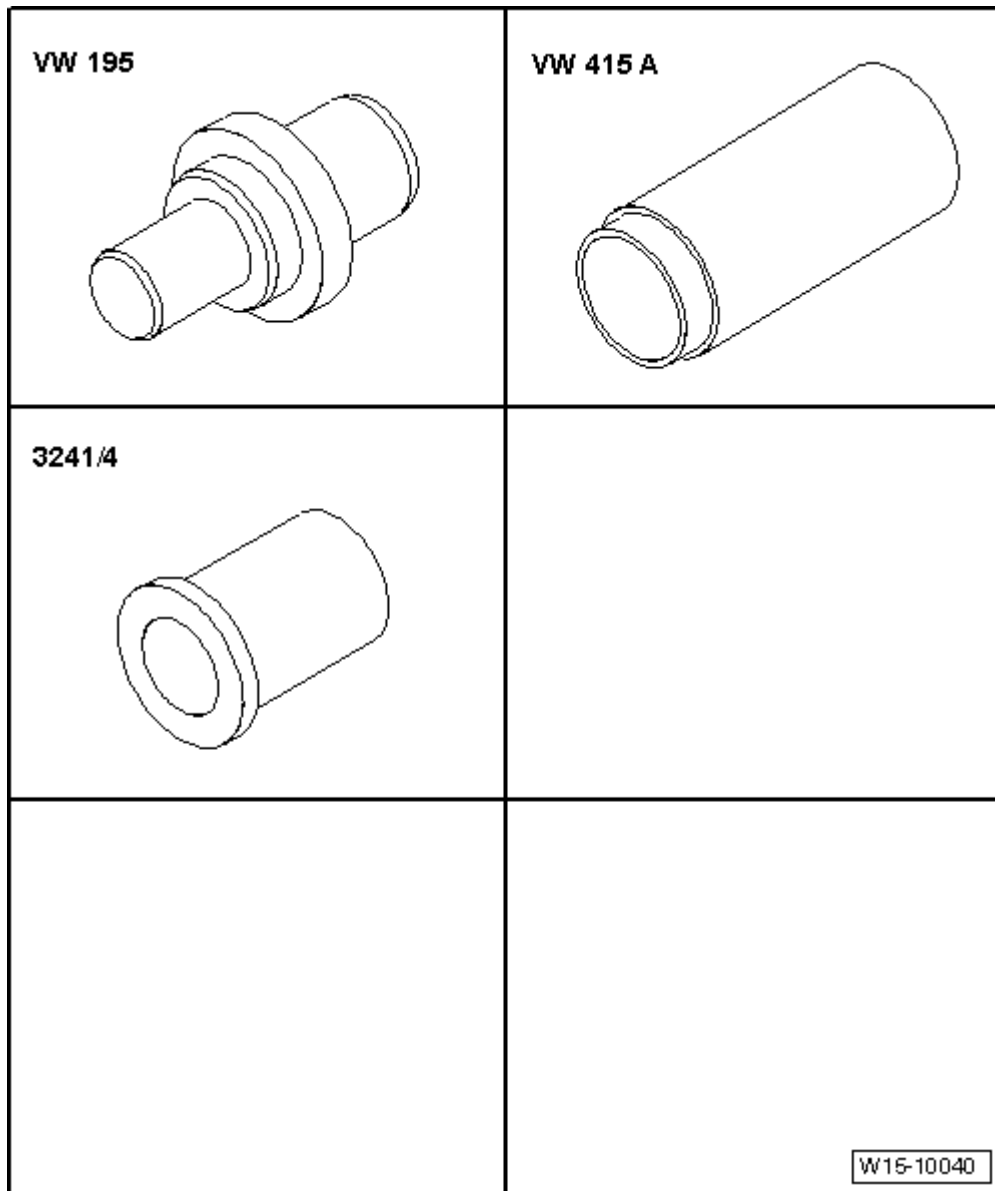


Fig. 62: Identifying Special Tools -- Chain Case Cover Sealing Ring, Replacing
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Arbor VW 195
- Tube 60 mm Dia. VW 415 A
- Fitting Sleeve 3241/4