



## N63TU Valve Stem Seal Tool Kit

Part #: AGA-N63TU-VST-K

BMW Part #: 83 30 2 450 434



### Problem:

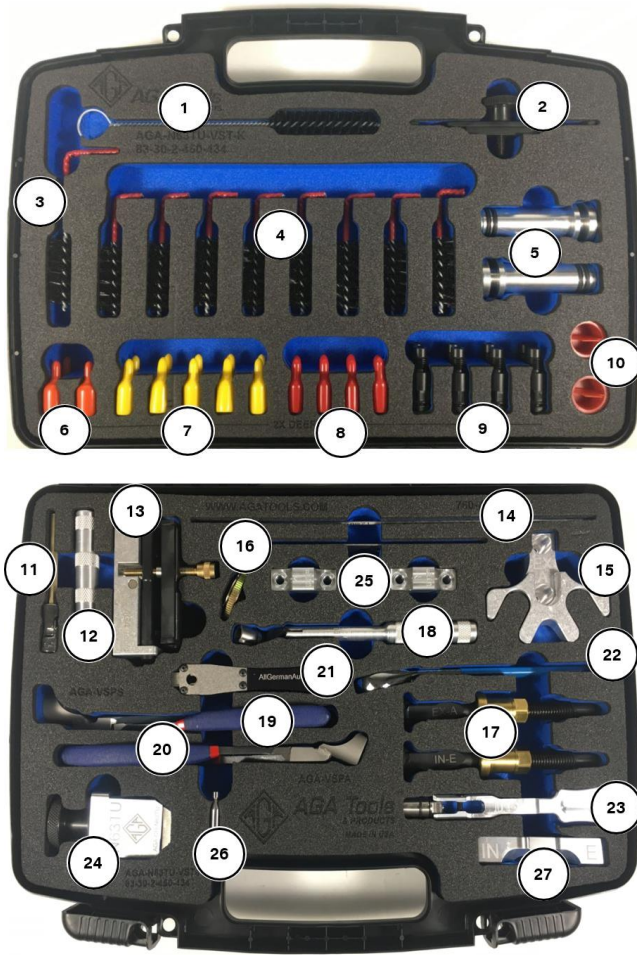
The vehicle has smoke from the tailpipe when starting or aggressively accelerating and decelerating the engine. Or maybe there is excessive oil consumption. These few symptoms are signs of leaking valve stem seals.

### Solution:

Using the AGA N63TU Valve Stem Seal Tool Kit. Perform the valve stem seal repair without removing the engine, camshafts or cylinder heads from the vehicle.

### Benefit:

This repair not only saves you a lot of hours and labor, but also eliminates the huge risk of returning customers with cylinder head gasket issues, oil leaks or camshaft timing issues. This is one of the few tools a shop can buy and recover the cost on the 1st job performed.



**Note:** All quantities are one unless otherwise specified. Replacement parts can be ordered from AGA Tools. Please email [rich@agatools.com](mailto:rich@agatools.com) or call us at 760-738-4084.

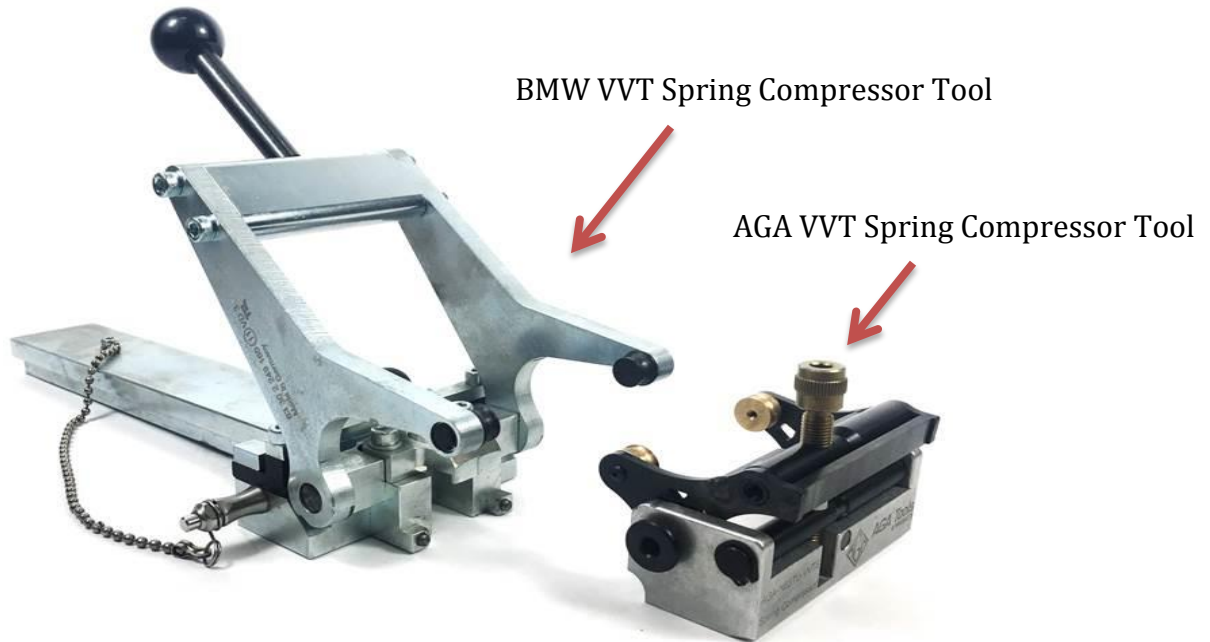
**Parts in this kit:**

1. Hand Brush P/N AGA-HB-8-34
2. Injector Plug Hold Bracket with Knob P/N AGA-N63TU-IPHB
3. Timing Hole Brush P/N AGA-N63TU-THB
4. Plug Brush P/N AGA-N63-PB-34 (Qty-8)
5. Fuel Injector Sealing Plug P/N AGA-N63TU-FISP (Qty-2)
6. Injector Rail Supply Cap P/N AGA-CP-O14 (Qty-4)
7. Injector & Injector Rail Cap P/N AGA-CI-Y12-10 (Qty-10)
8. Injector Line Cap P/N AGA-LC-R08 (Qty-8)
9. Spark Plug TDC Tool P/N AGA-SPT12-125 (Qty-8)
10. Injector Bore Plastic Plug P/N AGA-N63TU-IBPP (Qty-2)
11. 5mm Universal Allen P/N AGA-UA-60
12. VVT Spring Lever P/N AGA-N63TU-VSL
13. VVT Spring Compressor P/N AGA-N63TU-VVTS
14. TDC Indicator Flag P/N AGA-TDC-1
15. Exhaust Compression Bracket P/N AGA-N63TU-ECB
16. VVT Wrench 4mm P/N AGA-VVT-R-N63TU
17. Compression Rod P/N AGA-N63TU-CR (Qty-2)
18. Exhaust Valve Keeper Tool P/N AGA-N63TU-EVKT
19. Valve Seal Pliers Straight P/N AGA-VSPS
20. Valve Seal Pliers Angled P/N AGA-VSPA
21. Locator Handle P/N AGA-VST-LH
22. Ratcheting Wrench P/N AGA-RW-N63
23. Intake Valve Keeper Tool P/N AGA-N63TU-IVKT
24. Chain Holder P/N AGA-CH-N63TU
25. Camshaft Bracket P/N AGA-N63TU-CB (Qty-2)
26. Valve Seal Installer P/N AGA-N63TU-VSIT
27. Intake Compression Bracket P/N AGA-N63TU-ICB



## N63TU VVT Spring Compressor

Part #: AGA-N63TU-VVTS



### Problem:

You are trying to replace the intermediate levers, rocker arms or other valve train components using the BMW VVT Spring Compressor tool. But because their spring compressor is large, it will not fit inside the engine compartment. Following the workshop instructions, the first step is to remove the engine along with front axle.

### Solution:

VVT Spring Compressor by AGA Tools. Designed and made here in the USA, this compact VVT Spring Compressor will allow you to do many different jobs with one simple tool.

### Benefit:

With this VVT Spring Compressor, you are now able to perform jobs such as replacing hydraulic lifters, rocker arms, intermediate levers, intermediate lever springs, intermediate lever blocks, intermediate shaft and also the intake cam without having to remove the engine. Not removing the engine will save you hours of labor!



Using the AGA Tool Tray and AGA Light Kit will reduce the risk of accidentally mixing parts around and prevent not being able to see inside the engine bay. Good light source and working tool tray will make any job an ease and reduce fatigue.

**Note:** For clarity purposes, the procedure described in this document was performed with the engine on an engine disassembly/assembly stand for clarity purposes. Performing this job with the engine inside or outside the vehicle is up to the user's discretion.

1. Refer to the following repair instructions for preliminary work.

Removing and installing engine:

11 00 598 Removing and installing engine on front axle (N63O1)

**Note:** If engine is not being removed, continue onto next step.

11 12 005 Removing and installing/sealing left cylinder head cover (N63O1)

11 12 006 Removing and installing/sealing right cylinder head cover (N63O1)

**Note:** Complete this repair instruction in its entirety. Used rocker arms and intermediate levers may only be reused in the same position. Note the locations of all parts when they are removed.

**The internal engine part locations cannot be interchanged.**

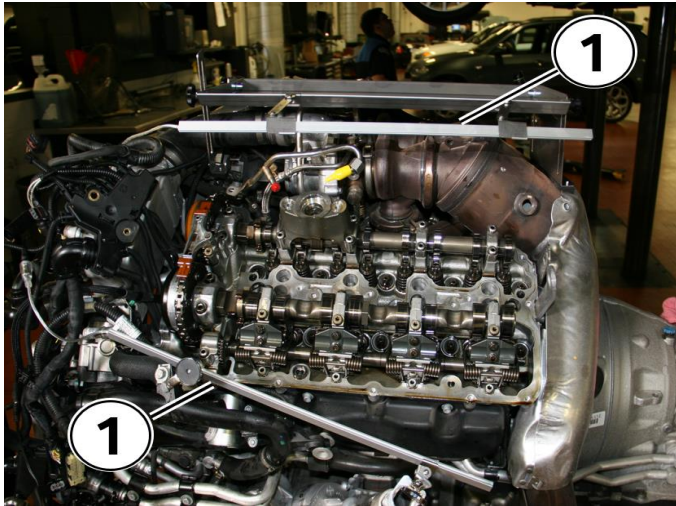
**Do not remove the camshafts, timing chain, or VANOS gears. Proceed to step 2.**



2. Engine removed from the vehicle and placed on the engine bench as per Repair Instruction 11 00 598 "Removing and installing engine on front axle".



2. Engine removed from the vehicle and placed on the engine bench as per Repair Instruction 11 00 598 "Removing and installing engine on front axle".



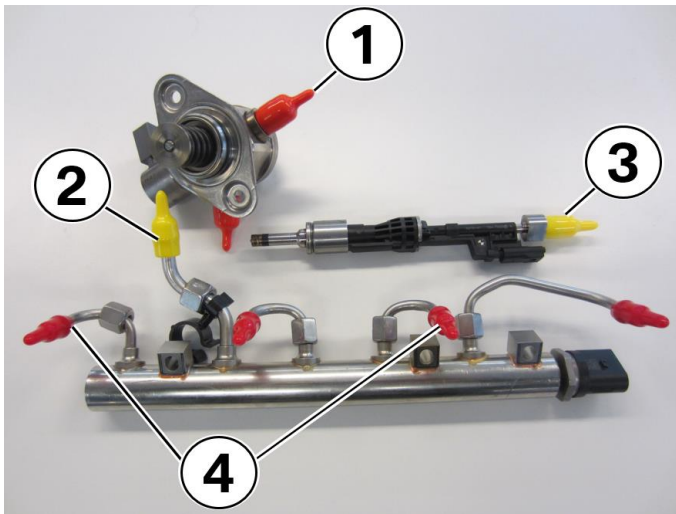
3. Engine preparation on table.

Cylinder head covers are removed.

For low lighting situations the AGA LED lighting system (1) P/N AGA-ULK-20 is available via the AGA website.

[www.agatools.com](http://www.agatools.com)

P/N AGA-ULK-20



4. When removing the fuel system components utilize the orange, red and yellow caps found in the kit to protect the fuel injectors, fuel pumps and fuel lines from contamination.

Example:

Fuel pump – AGA-CP-O14 – Orange (1)

Fuel rail pump connection – AGA-CI-Y12-10 – Yellow (2)

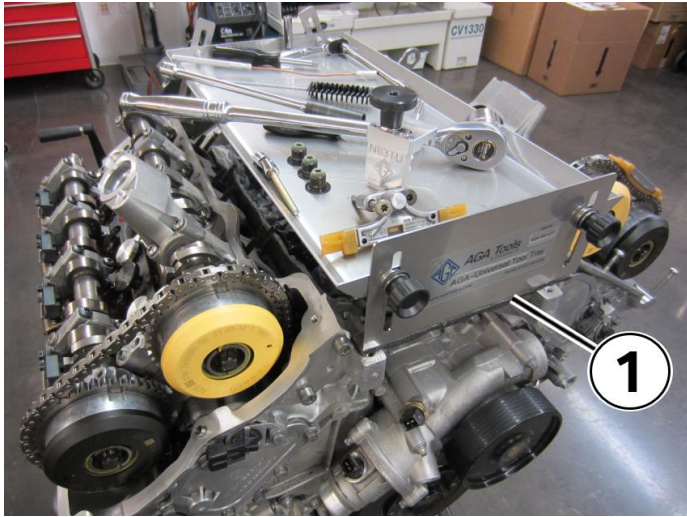
Fuel Injector – AGA-CI-Y12-10 – Yellow (3)

Fuel rail injector connection – AGA-LC-R08 – Red (4)

5. In this instruction the engine is placed on the engine assembly stand for clarity purposes. Cylinder head covers are removed.

Do not remove the transmission from the engine for this procedure.

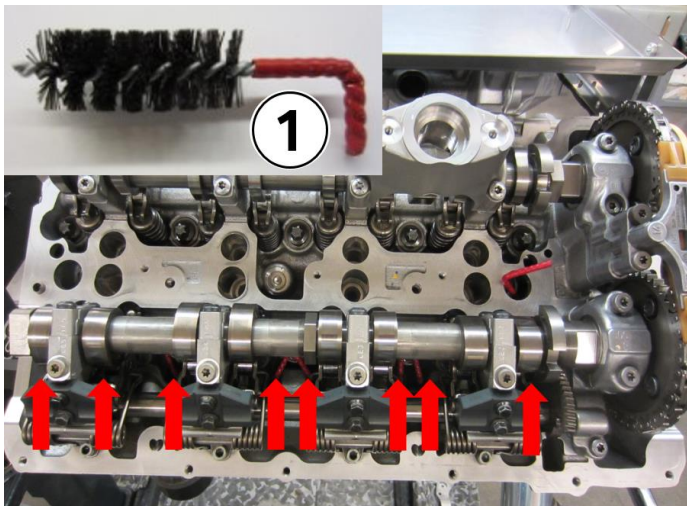
Do not remove the turbochargers.



For this demonstration the AGA Tool Tray (1) P/N AGA-SS-UTT is utilized. This tray can be obtained via the AGA website.

[www.agatools.com](http://www.agatools.com)

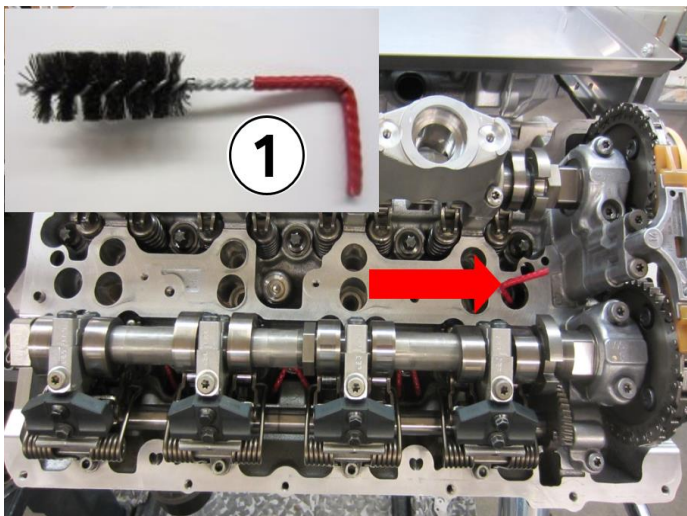
P/N AGA-SS-UTT



6. Install the eight supplied plug brushes (1) into the eight oil drain back holes (see arrows) in the cylinder head. The drain back holes are located on either side of the cylinder head bolts.

If a keeper is dropped, use a magnet to retrieve the keeper from around the brush. Do not remove the brushes until all keepers are accounted for.

P/N AGA-N63-PB-34

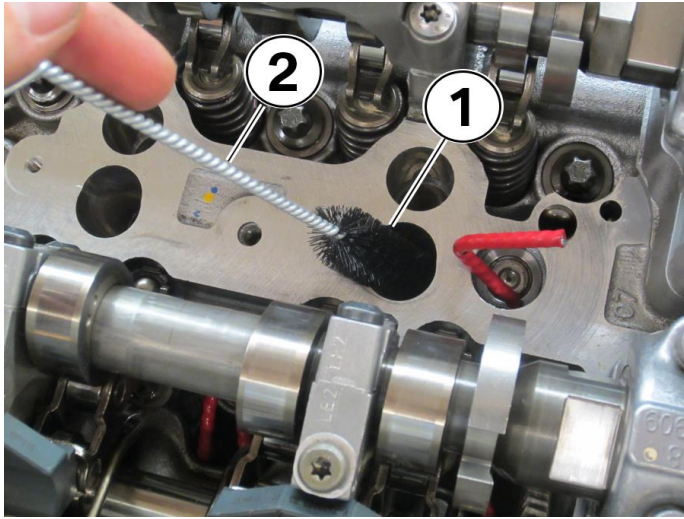


7. Install the single plug brush (1) into the cylinder head drain back hole just below the exhaust camshaft (see arrow).

The brush must seal the hole leading to the timing chain cavity.

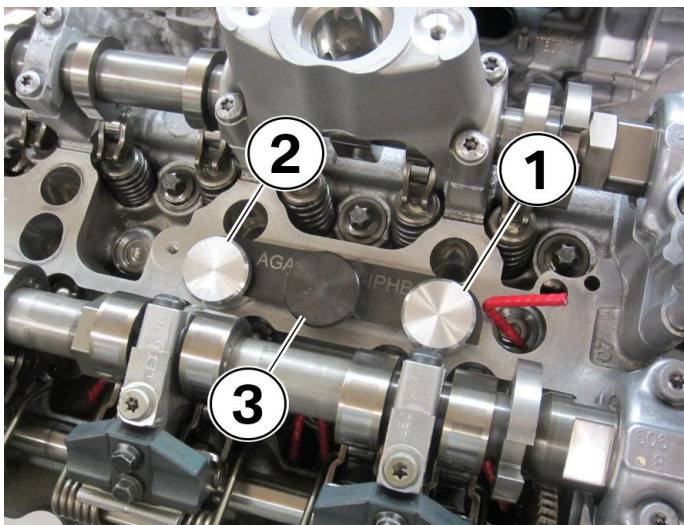
If a keeper is dropped, use a magnet to retrieve the keeper from around the brush. Do not remove the brushes until all keepers are accounted for.

P/N AGA-N63-THB



8. Gently clean the upper portion of the injector bores (1) with the brush (2) before installing the fuel injector sealing plugs.

P/N AGA-HB-8-34



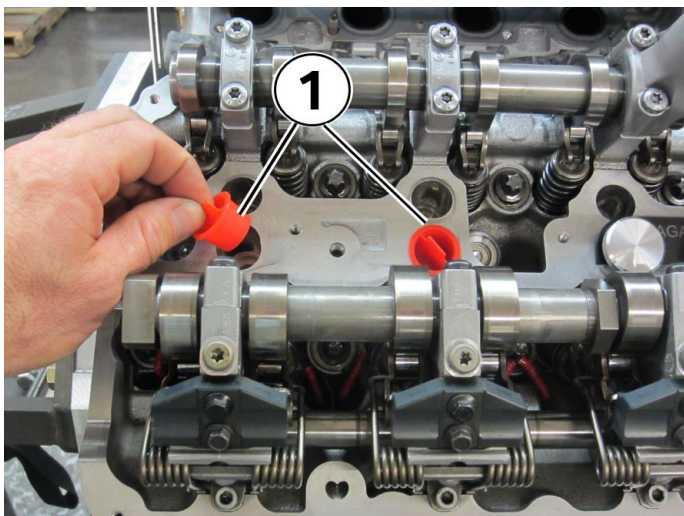
9. Install the fuel injector sealing plugs into the cylinder 1 and 2 injector bores (1 & 2).

Install hold down bracket and tighten the thumb screw (3).

P/N AGA-N63TU-FISB

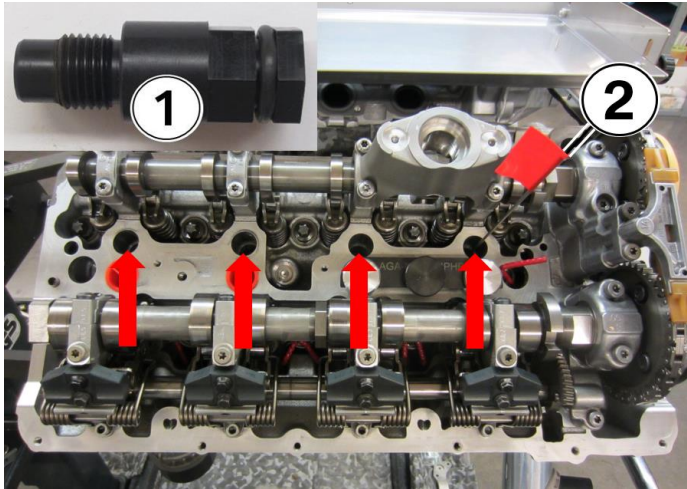
P/N AGA-N63TU-FISB

P/N AGA-N63TU-IPHB



10. Install the two red plugs into the remaining open injector bores (1) so that debris cannot fall into the cylinders.

P/N AGA-N63TU-IBPP



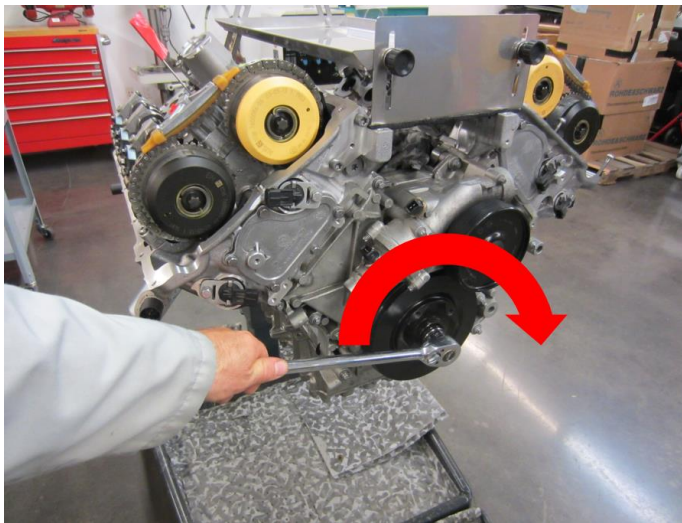
11. Screw four of the black plastic spark plug TDC tools (1) into each of the spark plug holes (see arrows) to avoid debris from falling into the cylinders.

Hand-tighten the TDC tool (1) using BMW tool number 12 1 220 and a short 3/8 extension.

Insert the TDC flag into cylinder 1 (2).

P/N AGA-SPT12-125

P/N AGA-TDC-1

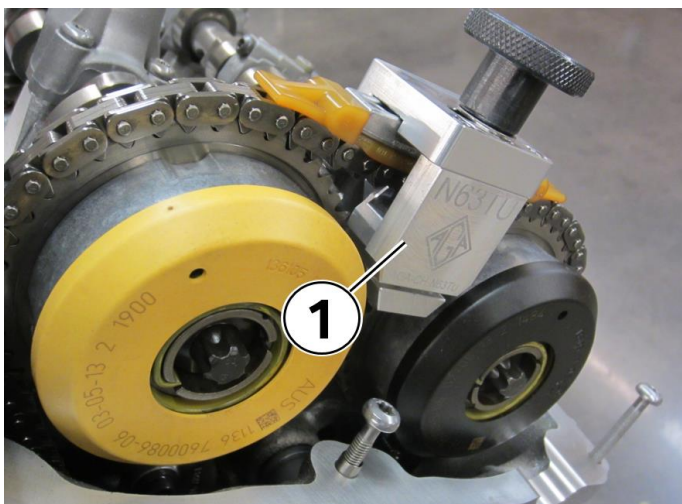


12. Rotate the engine slowly in the clockwise direction (see arrow).

Stop turning the engine when cylinder 1 TDC is reached.

It is good practice to turn the engine 1-2° past TDC (clockwise), so that the compressed air does not turn the engine backwards.

**Do not apply compressed air to the cylinder yet.**



13. Install the timing chain holder (1) onto the same or opposite cylinder bank timing chain guide rail.

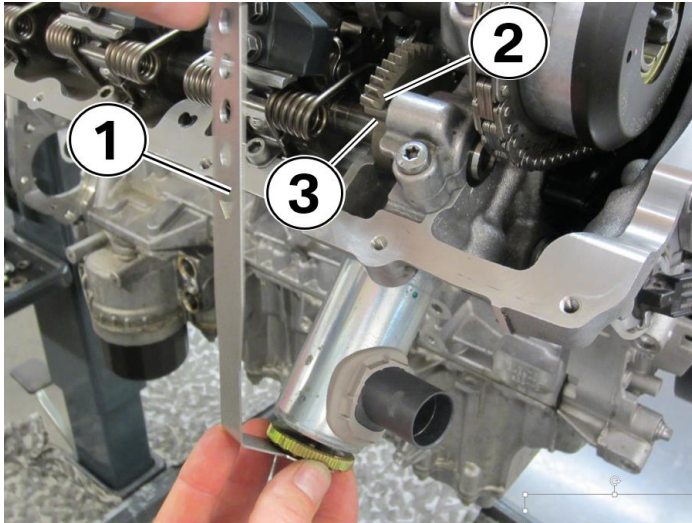
Installing this tool will prevent the engine from rotating when the air is applied to the cylinders.

Make sure the teeth on the tool match the chain teeth before tightening.

**Tighten gently with one hand.**

P/N AGA-CH-N63TU





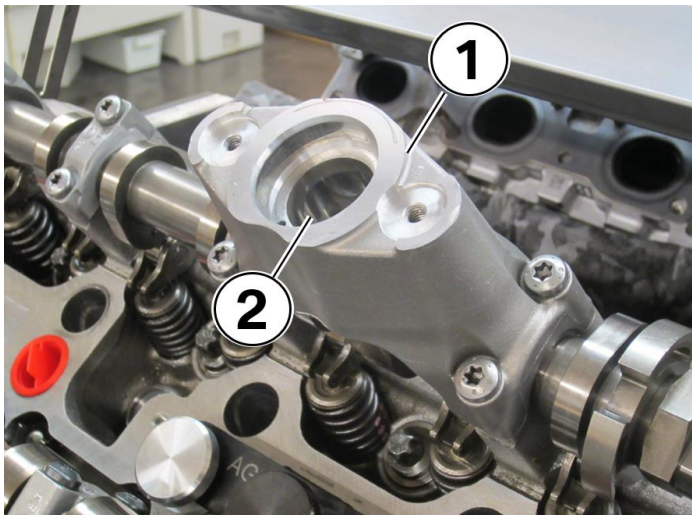
14. Move the VVT motor to the minimum lift position by rotating the VVT motor counter clockwise with VVT 4mm wrench tool AGA-VVT-R-N63TU (1).

The gear (2) should make contact with the stop pin (3) indicating the eccentric shaft is in the minimum lift position.

If not moved to the minimum lift position then the VVT spring cannot be removed.

P/N AGA- VVT-R-N63TU

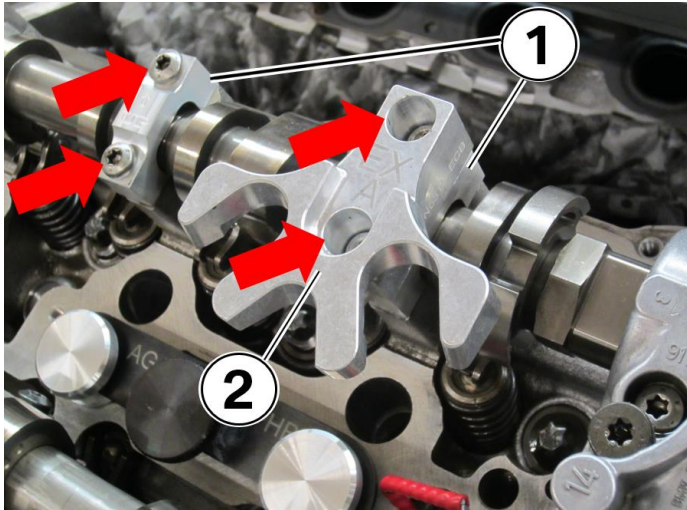
15. For clarity purposes start with the exhaust valve seals to help understand the tools and the procedures.



16. Remove the high pressure pump adaptor (1).

Do not drop or damage the high pressure pump camshaft follower (2).

The camshaft follower can be removed using a magnet.



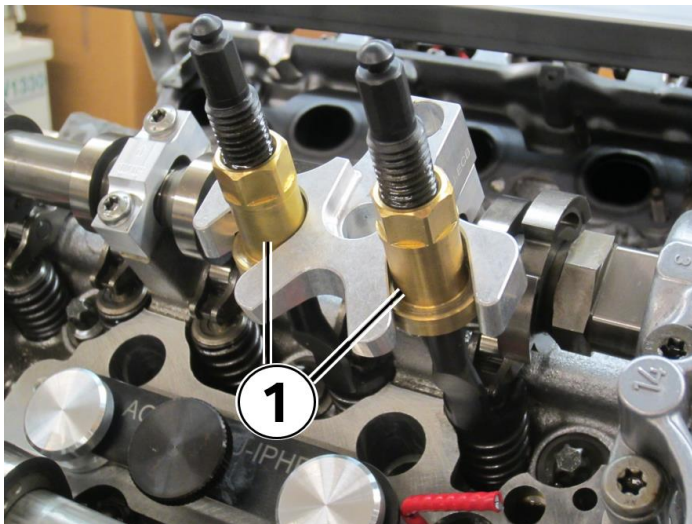
17. Install the two camshaft brackets (1).

Install the exhaust compression bracket over the top of the camshaft bracket that aligns with the cylinder that will be receiving the new valve seals (2). Each bracket has an arrow that should be pointing upward.

Use the high pressure pump adaptor screws to secure the brackets. Hand tighten all of the screws. See the arrows.

P/N AGA-N63TU-CB

P/N AGA-N63TU-ECB

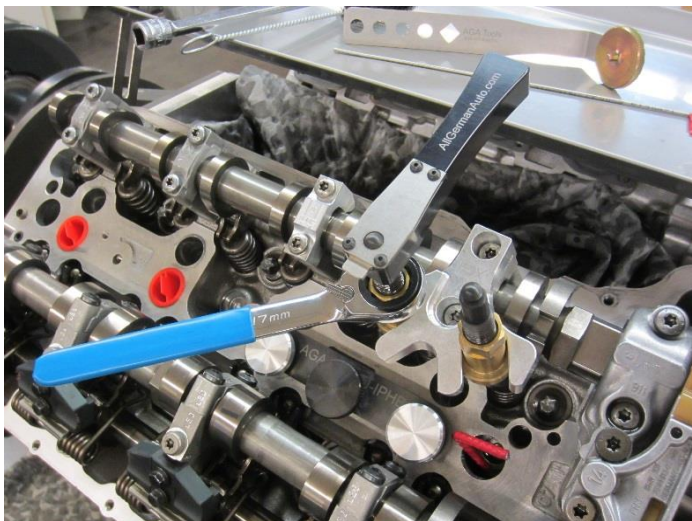


18. Install the compression rods (1) to remove the rocker arms.

Use your fingers to adjust the nuts in the counter clockwise to pretension the compression rods.

Ensure the feet of the compression rods are always centered on the spring retainers.

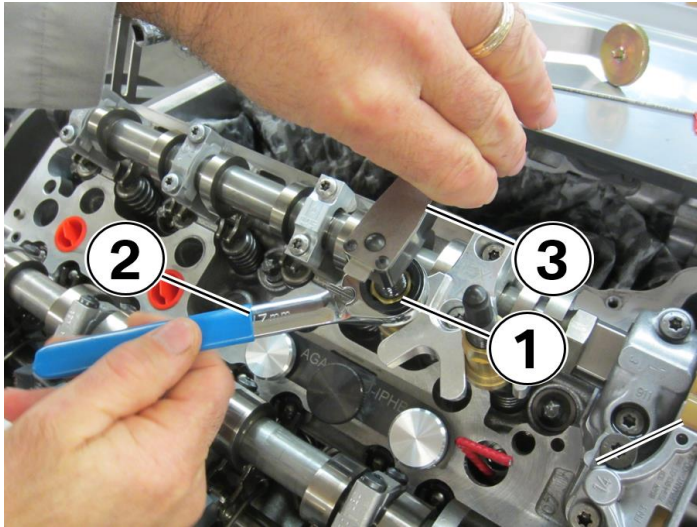
P/N AGA-N63TU-CR



19. Install the handle and the ratchet.

P/N AGA-RW-N63

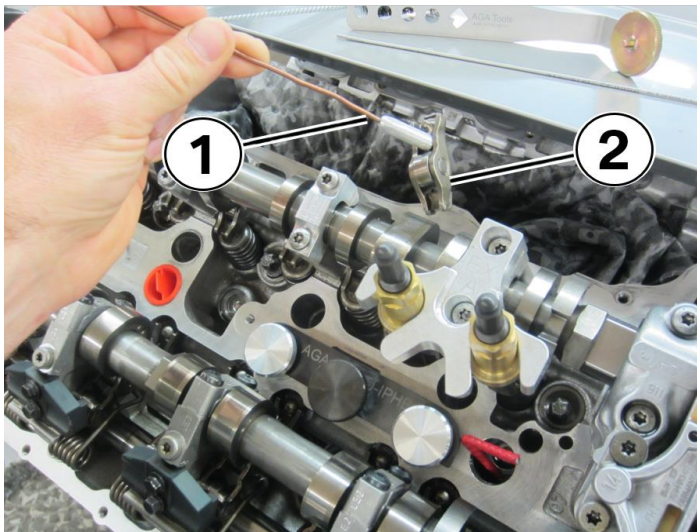
P/N AGA-VST-LH



20. Rotate the compression nut (1) counter clockwise with the ratchet (2) until the compression rod compresses the valve spring.

Hold the locator handle (3) firmly to keep the compression rod properly centered on the valve spring retainer.

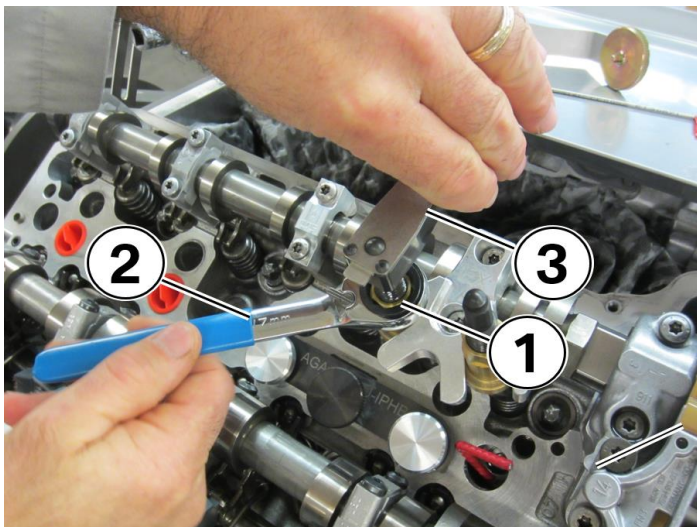
Repeat this process on the adjacent valve spring.



21. Use a small magnet (1) to retrieve the rocker arms (2) one at a time.

Store them in a location such as the recommended AGA Universal Tool Tray (P/NAGA-SS-UTT) so that they are organized in the order they were removed.

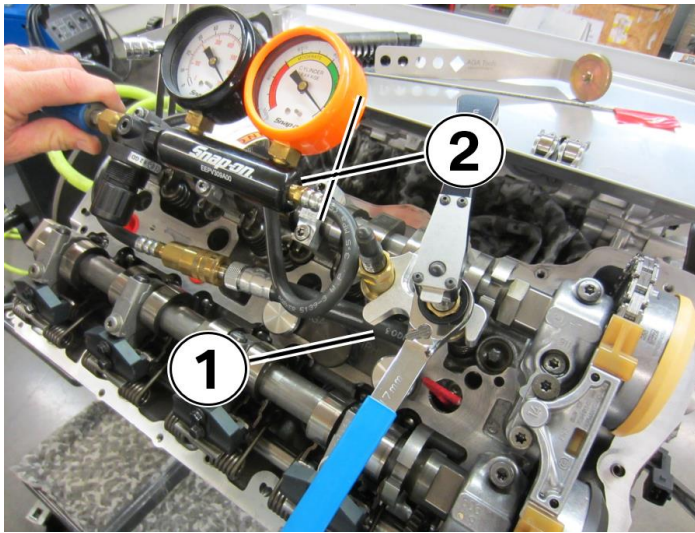
Repeat this process on the adjacent valve spring.



22. Rotate the compression nut (1) clockwise with the ratchet (2) until the compression rod releases the valve spring.

Hold the locator handle (3) firmly to keep the compression rod properly centered on the valve spring retainer.

Repeat this process on the adjacent valve spring.

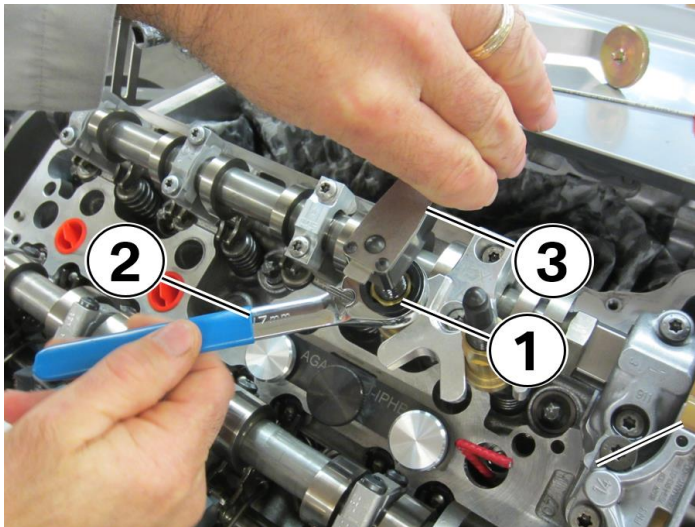


23. Remove the black plastic TDC tool from cylinder 1. Install the leak down test adaptor (1) into the cylinder spark plug hole.

Use a cylinder leak-down tester (2) to supply air pressure to the cylinder. The air pressure will hold the valves in the closed position while removing the valve spring retainer, valve spring, and keepers.

A leak-down tester already has a predetermined pressure, so that no damage occurs to the engine.

**Never apply shop air directly to the cylinder.**

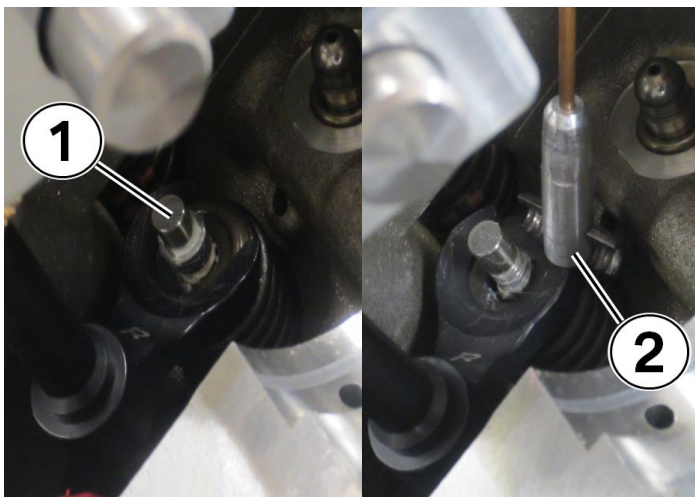


24. Rotate the compression nut (1) counter clockwise with the ratchet (2) until the compression rod compresses the valve spring.

Hold the locator handle (3) firmly to keep the compression rod properly centered on the valve spring retainer.

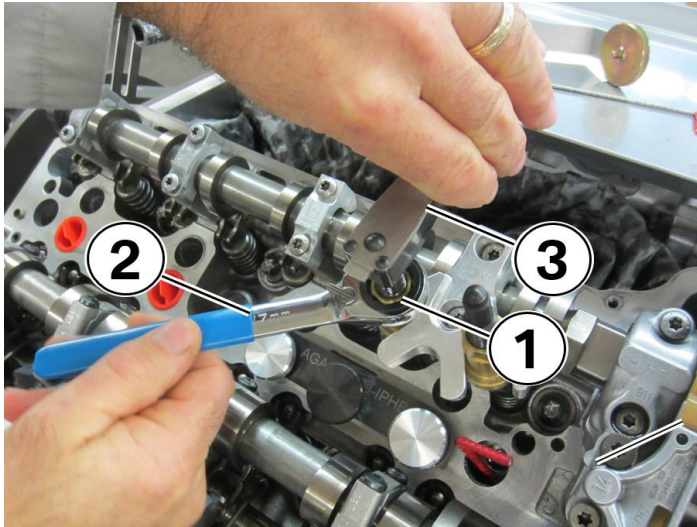
When the valve keepers are exposed stop turning the compression nut.

Repeat this process on the adjacent valve spring.



25. When the valve stem and keepers are exposed (1), the keepers can be removed with a magnet (2).

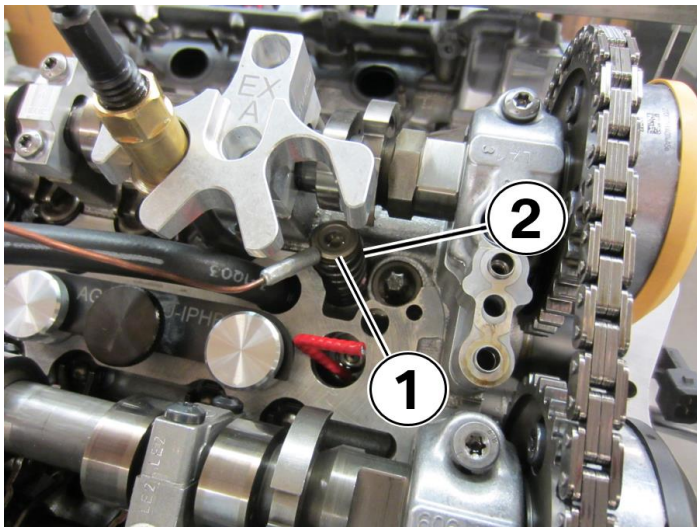
Repeat this process on the adjacent valve spring.



26. Rotate the compression nut (1) clockwise with the ratchet (2) until the compression rod releases the valve spring.

Hold the locator handle (3) firmly to keep the compression rod properly centered on the valve spring retainer.

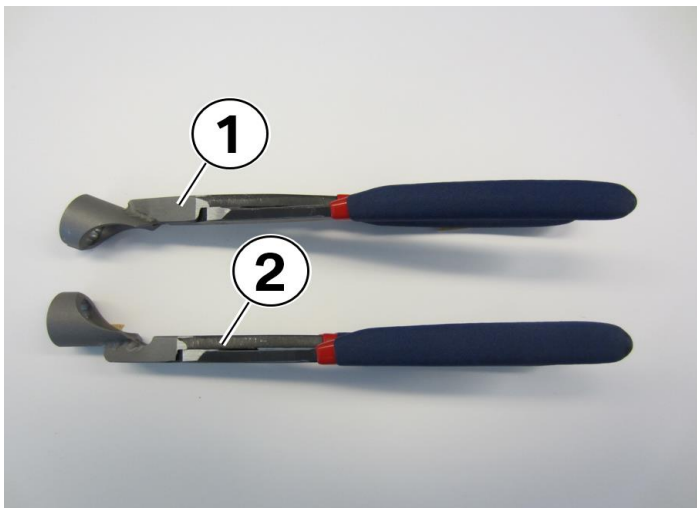
Repeat this process on the adjacent valve spring.



27. Using a small magnet remove the valve spring retainers (1) and valve springs (2) to expose the valve seal.

Store them in a location such as the recommended AGA Universal Tool Tray (P/NAGA-SS-UTT) so that they are organized in the order they were removed.

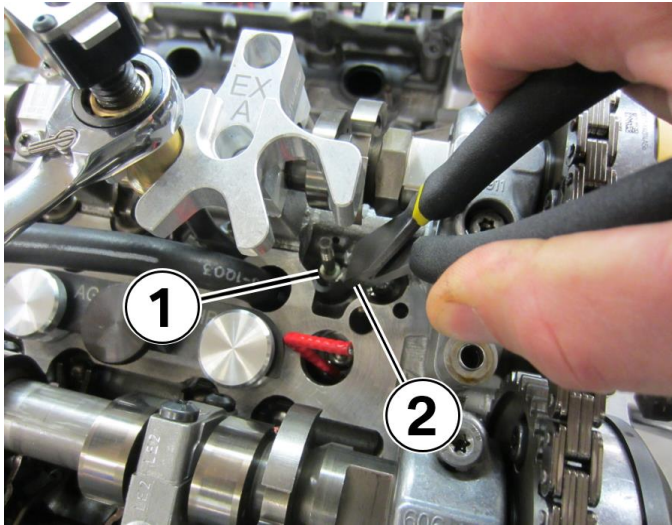
Repeat this process on the adjacent valve spring.



Valve Seal Plier Overview:

Angled valve seal pliers (1) P/N AGA-VSPA – All exhaust valves and intake cylinders 2, 3, 4, 6, 7 and 8 only.

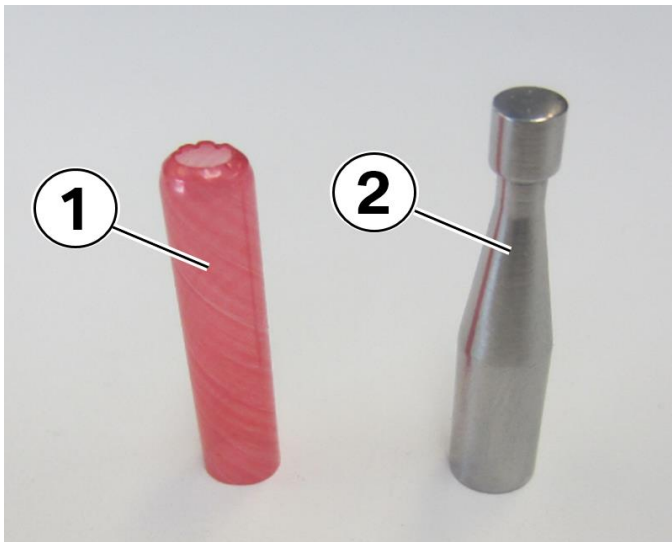
Straight valve seal pliers (2) P/N AGA-VSPS - Cylinder 1 and 5 intake valves only due to the VVT gear interference.



28. Remove the valve seals (1) with the angled seal pliers (2) included in the tool kit.

Repeat this process on the adjacent valve spring.

P/N AGA-VSPA

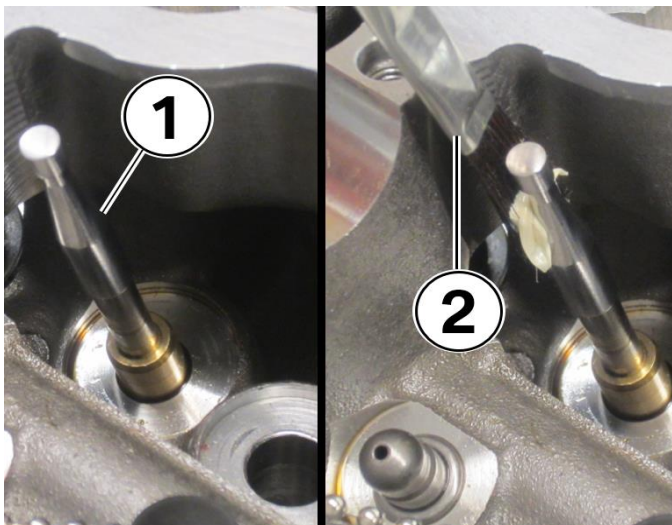


29. Installing the new valve seal can be done using either of these tools.

Valve stem protection sleeve (1) included with every valve seal kit P/N 11 34 0 039 494.

Or

Valve stem seal installation tool (2) P/N AGA-N63TU-VSIT that was provided with the tool kit.

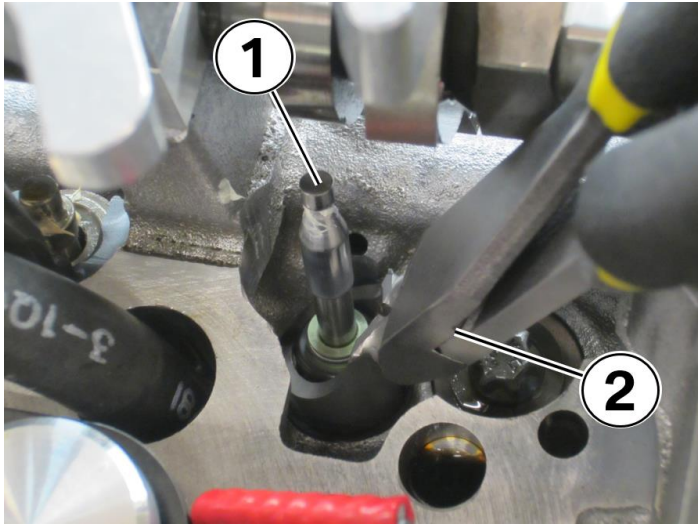


30. For this demonstration we will use the valve stem seal install tool (1) P/N AGA-N63TUVSIT that was provided with the tool kit.

Use a small magnet to remove and install the valve stem seal installation tool.

Apply a light coating of white lithium grease (2) to the tool exterior to help lubricate the valve seal installation.

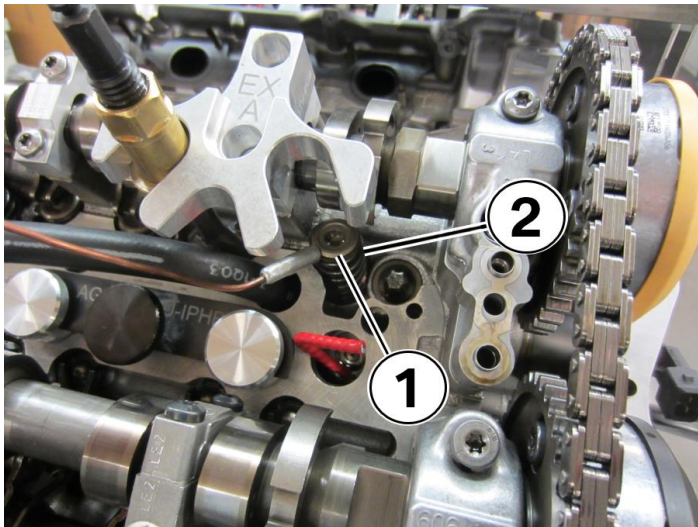
Repeat this process on the adjacent valve spring.



31. Install the new valve seal (1) with the angled seal pliers included in the tool kit (2).

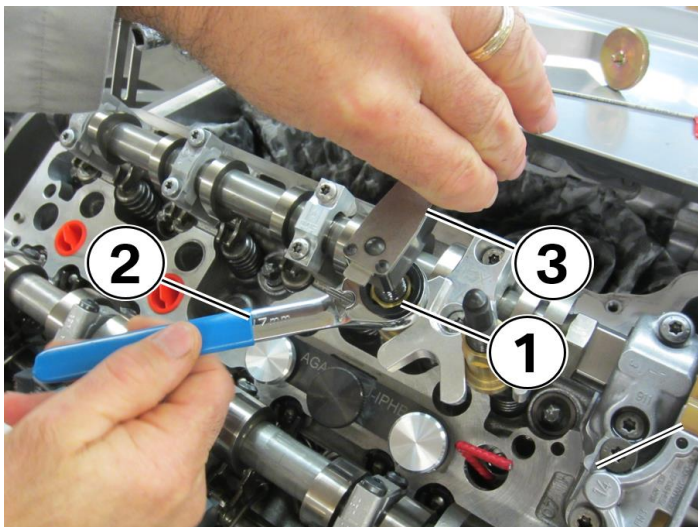
Push firmly to seat the valve seal.

Repeat this process on the adjacent valve.



32. Using a small magnet install the valve spring retainers (1) and valve springs (2).

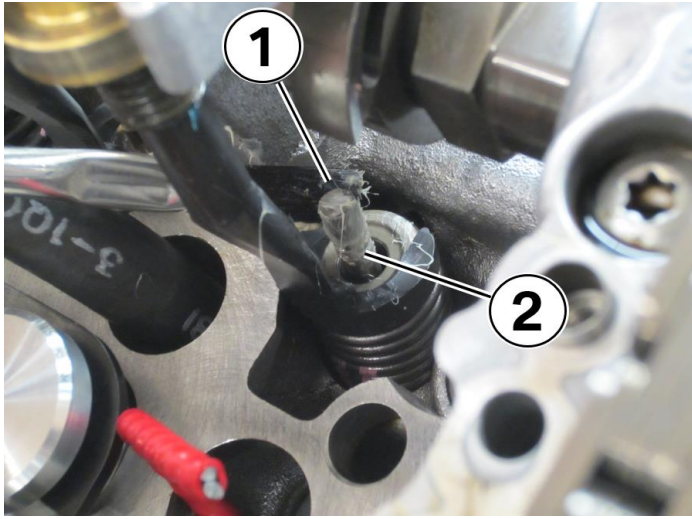
Repeat this process on the adjacent valve spring.



33. Rotate the compression nut (1) counter clockwise with the ratchet (2) until the compression rod compresses the valve spring.

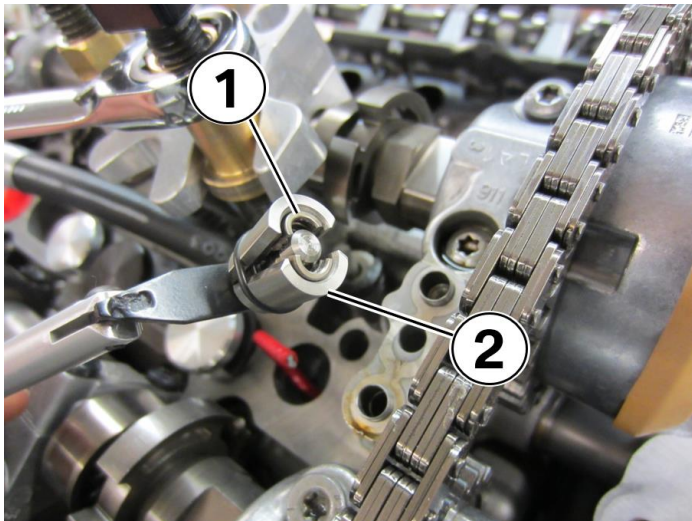
Hold the locator handle (3) firmly to keep the compression rod properly centered on the valve spring retainer.

Repeat this process on the adjacent valve spring.



34. When the valve stem is exposed (1), apply a small amount of white lithium grease to the keeper grooves only (2) with a brush to assist in holding the keepers in place.

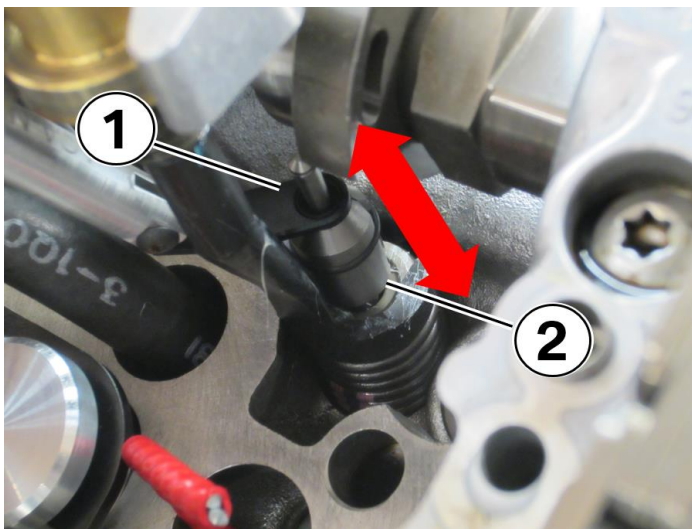
Repeat this process on the adjacent valve spring.



35. Install the keepers (1) into the N63TU valve keeper tool (2) P/N AGA-N63TU-EVKT as shown in the illustration.

Make sure the taper of the keepers are facing in correct direction.

P/N AGA-N63TU-EVKT

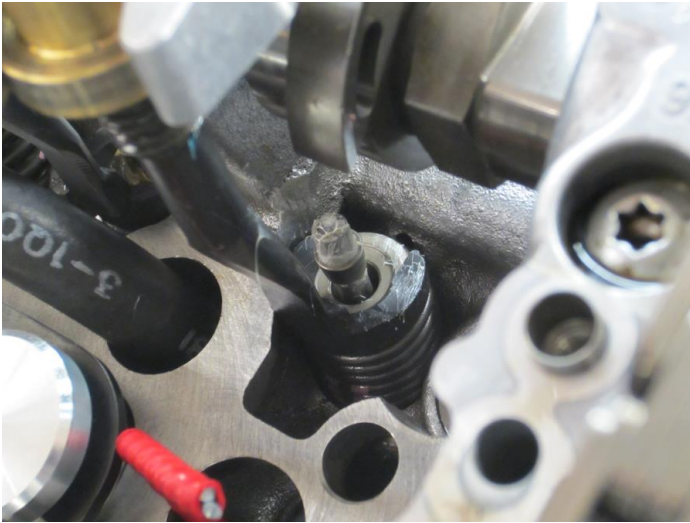


36. Place the keeper tool with keepers (1) over the valve stem (2) and push straight downward first then move the tool gently side to side to release the keepers (see arrow).

Gently lift the tool straight up, and the keepers will be left behind on the valve stem.

Repeat this process on the adjacent valve.

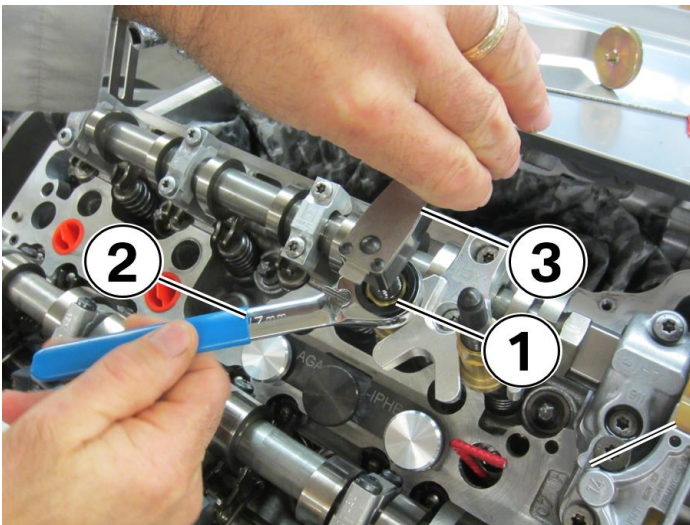




37. Inspect the position of the keepers on the valve stem to make sure they are in the proper position.

Do not wipe away any grease.

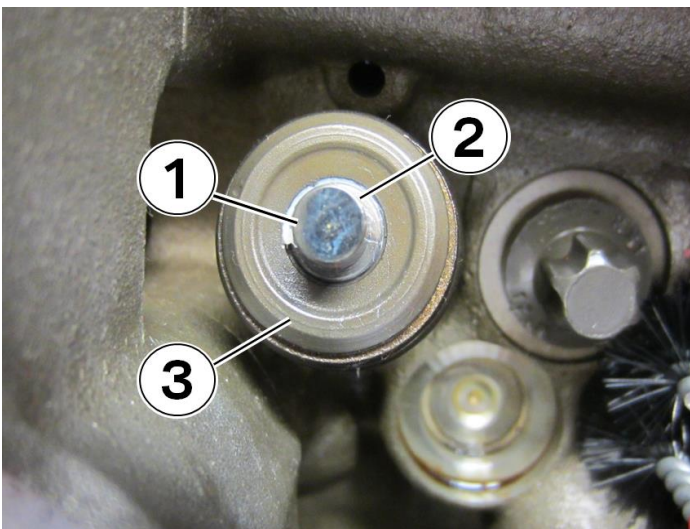
Repeat this process on the adjacent valve.



38. Rotate the compression nut (1) clockwise with the ratchet (2) until the compression rod releases the valve spring.

Hold the locator handle (3) firmly to keep the compression rod properly centered on the valve spring retainer.

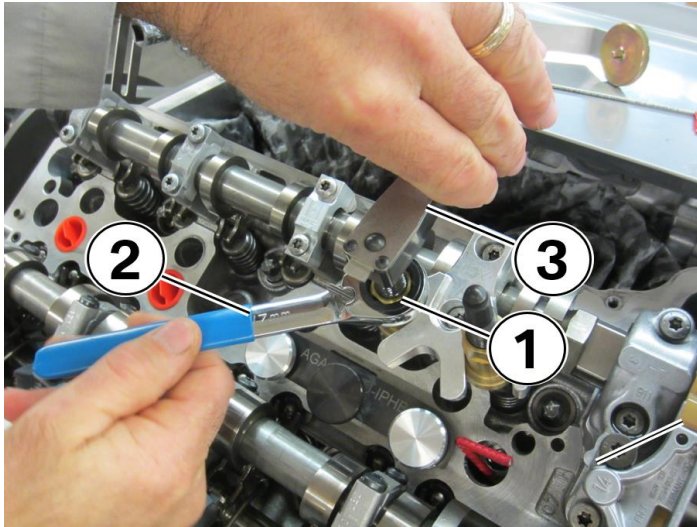
Repeat this process on the adjacent valve spring.



39. Wipe away the excess grease.

Inspect the valve stems (1), keepers (2), and the spring retainers (3) for the proper alignment before continuing.

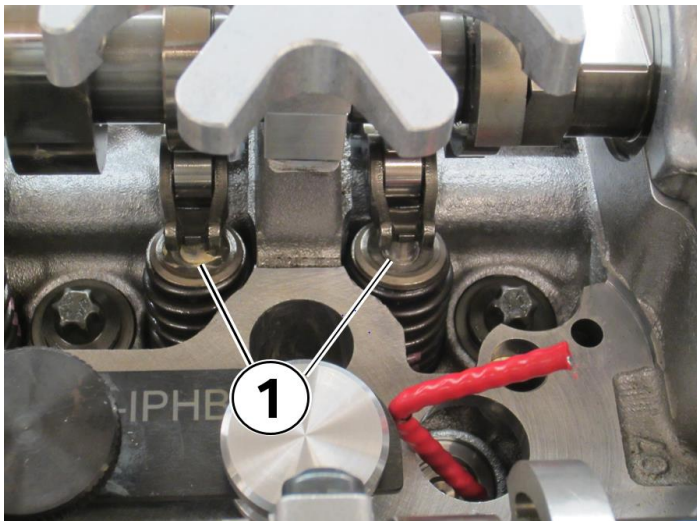
If the alignment is not correct, you will have to repeat steps 34-40.



40. Rotate the compression nut (1) counter clockwise with the ratchet (2) until the compression rod compresses the valve spring.

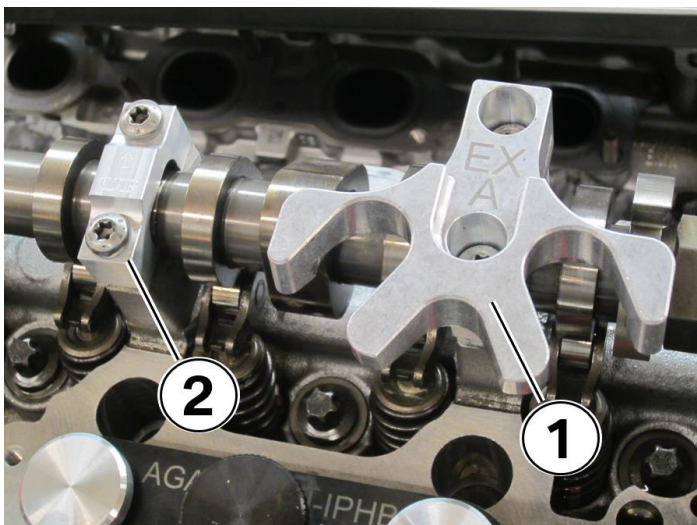
Hold the locator handle (3) firmly to keep the compression rod properly centered on the valve spring retainer.

Repeat this process on the adjacent valve spring.



41. When the rocker arms are in position then release the compression rods and remove them.

Check the alignment of the rocker arms (1) on the valve stems and lifters when complete.



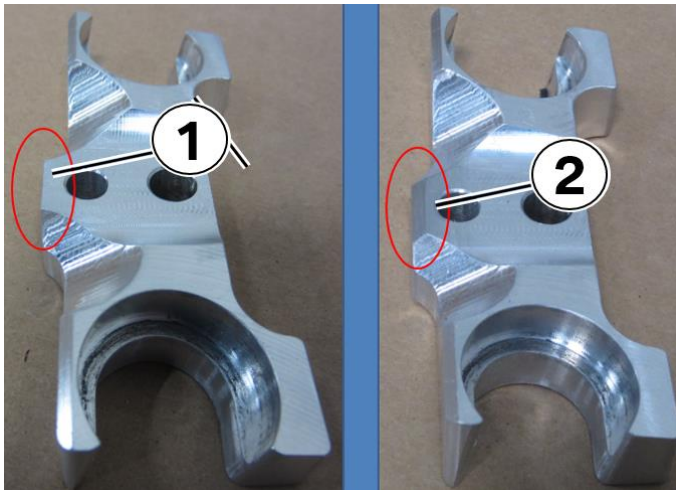
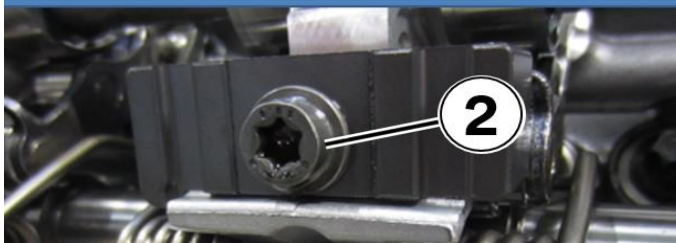
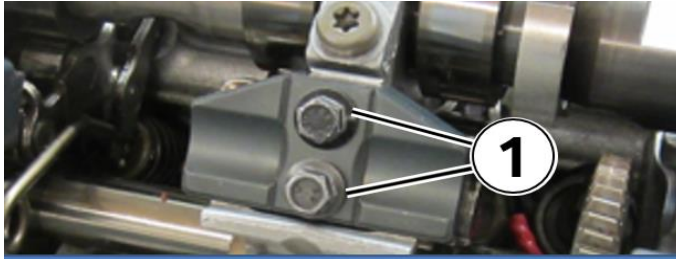
42. The exhaust valve seals are complete on this cylinder. Do not reinstall the HDP housing yet.

Move compression bracket (1) to cylinder # 2 bearing cap (2) and reinstall the bearing cap back onto cylinder # 1.

If the original camshaft bearing caps are reinstalled during this procedure then torque the mounting screws to 10 Nm.



43. Begin the intake valve seal replacement.



**UPDATE!**

Determine the type of spring block used in the engine.

1<sup>st</sup> generation (1) with two screws – Take no further action at this time.

2<sup>nd</sup> generation (2) with one screw – Modify the compression bracket in the next step.

**UPDATE!**

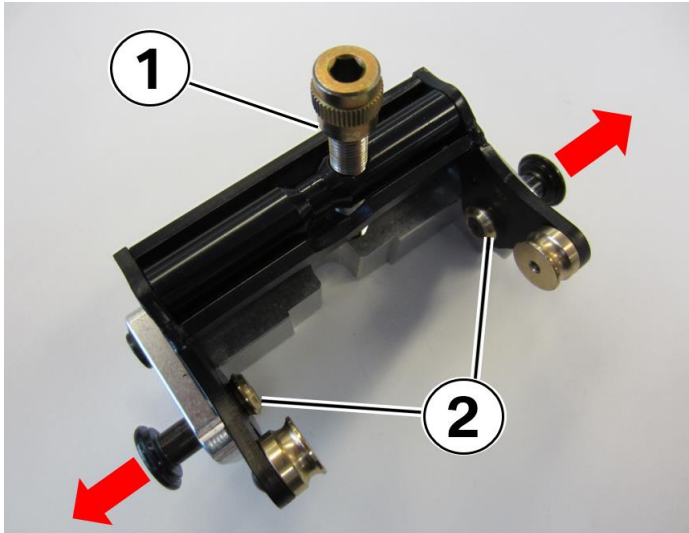
Modify the edge of the bracket using a suitable tool, metal file, miniature/compact grinder wheel, etc.

Before modification (1)

After modification (2)

After modification is complete finish the surface so that no burrs or sharp edges are present.

Continue with valve seal procedure.

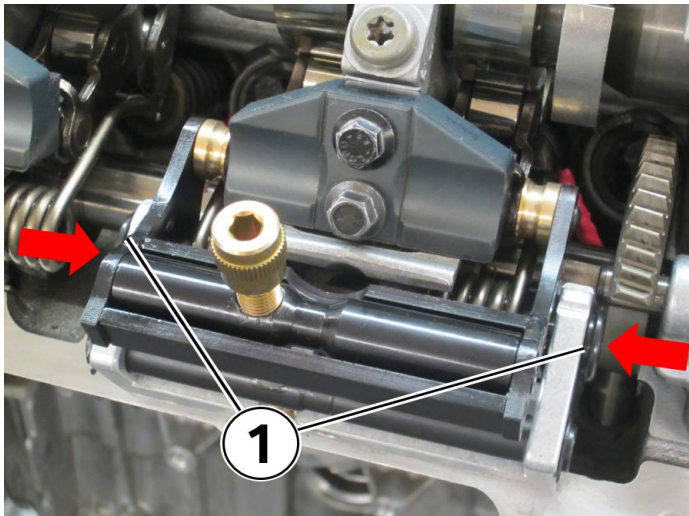


44. Prepare the VVT Spring Compressor (VVTS) tool included in the kit.

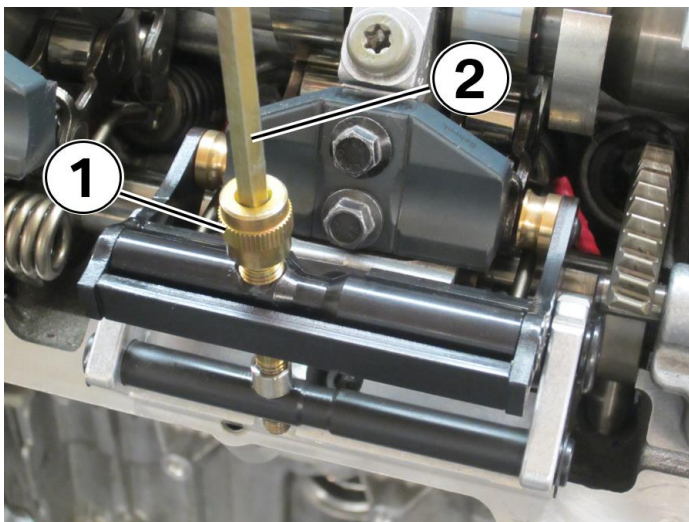
Rotate the screw (1) counter clockwise until it stops.

Push the spring retainer buttons (2) outward in the direction of the arrows.

P/N AGA-N63TU-VVTS

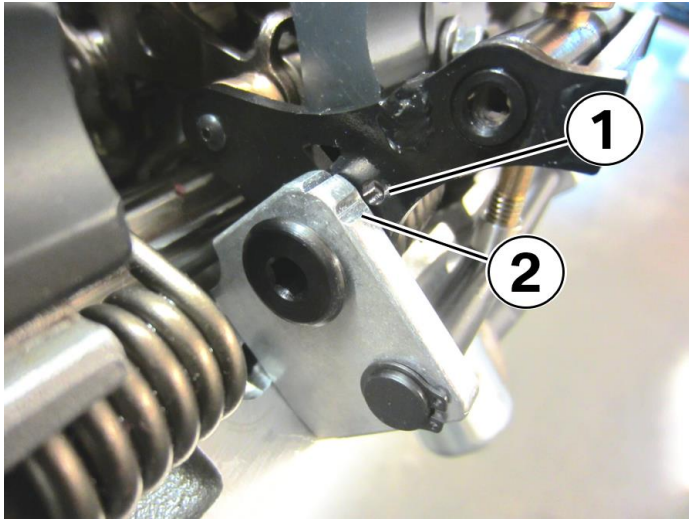


45. Install the VVTS tool as shown and push both of the spring retainer buttons (1) in the direction of the arrows to hold the coiled portion of the VVT spring.

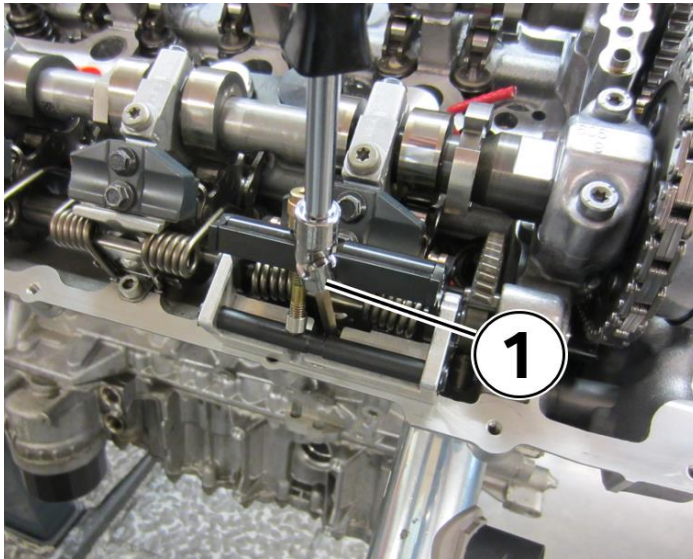


46. Turn the screw (1) clockwise to compress the spring (2) using the 5mm universal Allen socket enclosed in the kit.

P/N AGA-VA-60



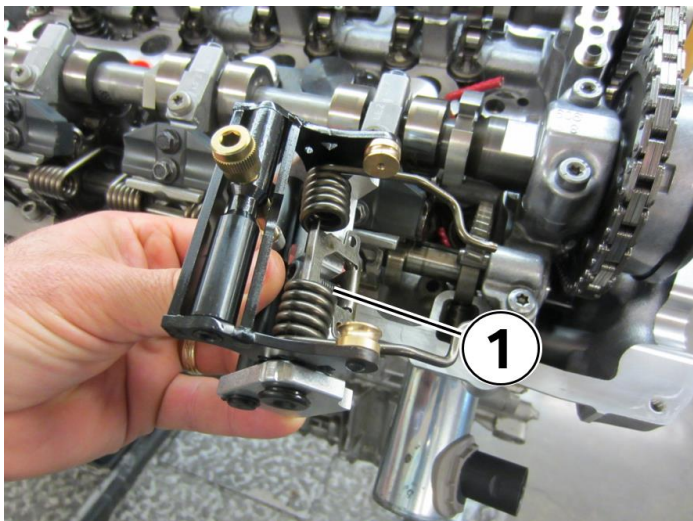
47. Continue to compress the spring until the round hole in the black arm (1) aligns with the half round machined notch in the silver aluminum frame (2).



48. Loosen the spring retaining screw (1) using the 5mm universal Allen socket.

Do not use power tools.

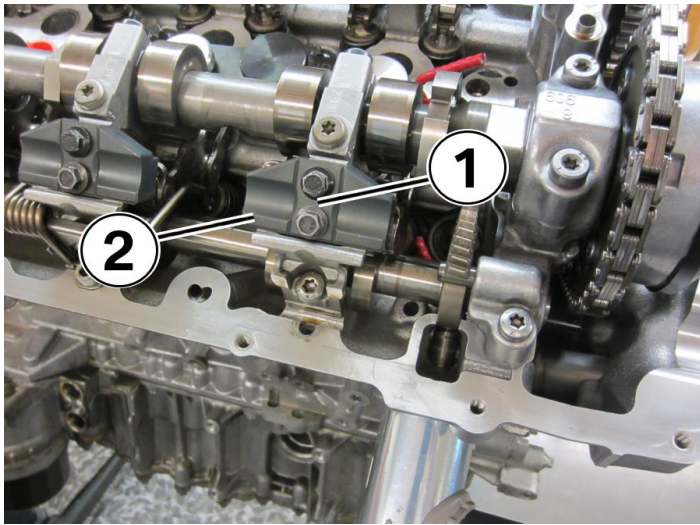
**Note:** The VVTS tool has an integrated magnet to secure the spring retaining screw so that it is not misplaced. The 5mm Allen socket will disconnect from the screw head when the screw comes in contact with the magnet.



49. Remove the VVTS tool and the VVT spring. Place the tool with compressed spring in a clean location.

Do not remove the spring from the VVTS tool.

The VVTS tool has an integrated magnet (1) to secure the spring retaining screw so that it is not misplaced.



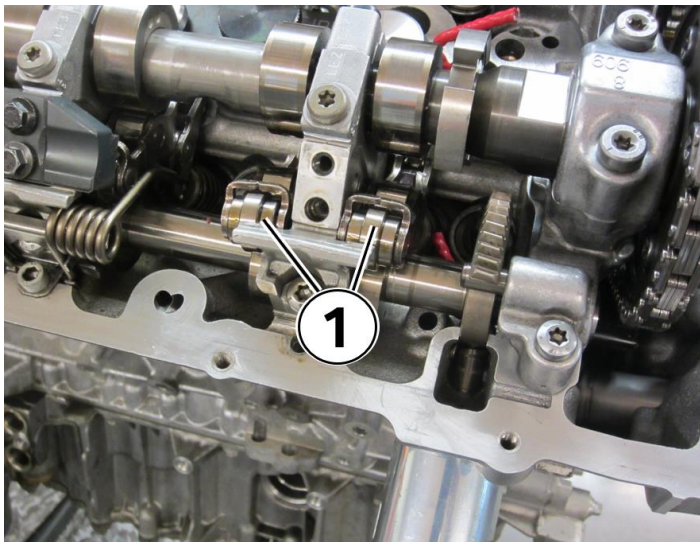
50. Remove both of the VVT spring block screws (1) and the VVT spring block (2).

**UPDATE!**

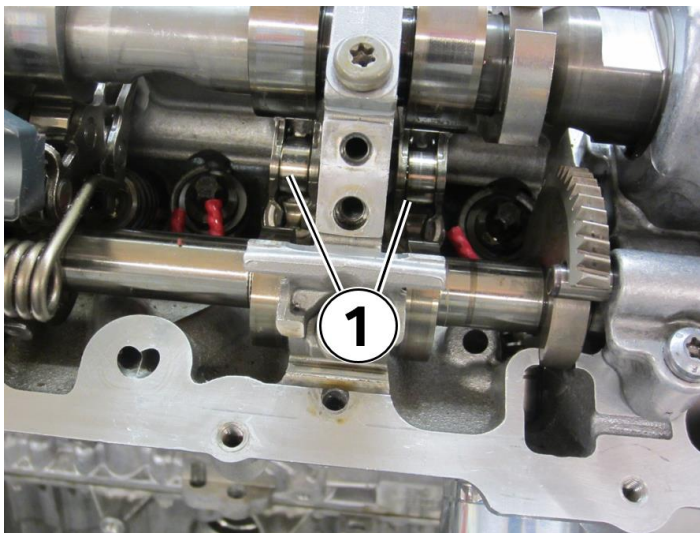
1<sup>st</sup> generation with two screws.

2<sup>nd</sup> generation with one screw.

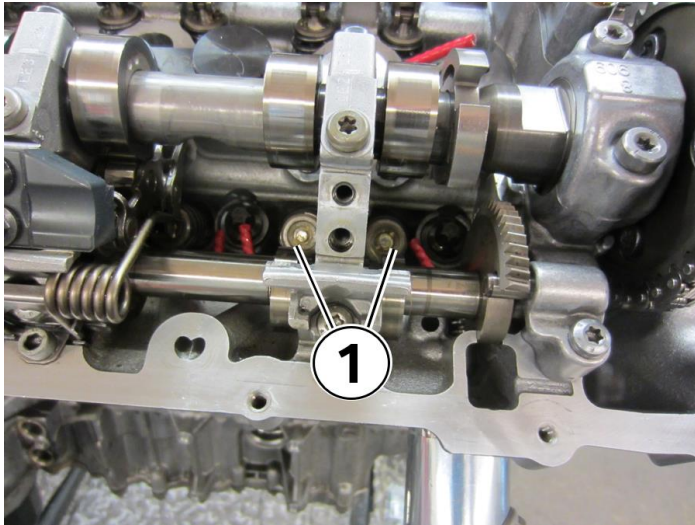
The procedure is the same for both generation spring blocks with the exception of the extra screw. The instruction was created with a 1<sup>st</sup> generation example.



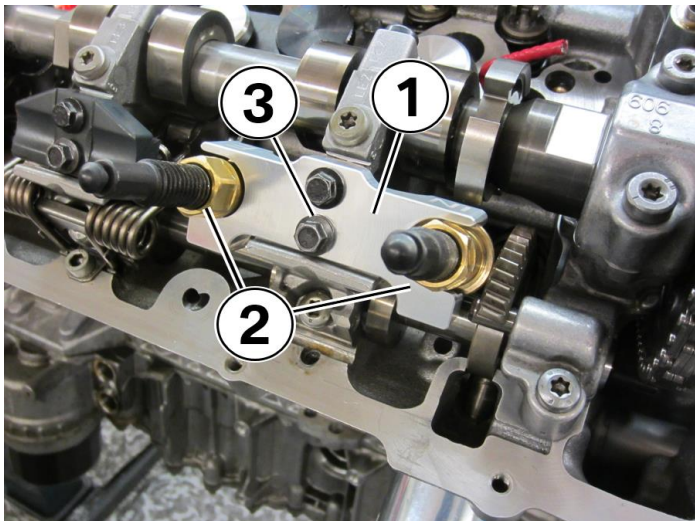
51. Remove the intermediate levers (1) and store them in a location such as the recommended AGA Universal Tool Tray (P/NAGA-SS-UTT) so that they are organized in the order they were removed.



52. Remove the rockers (1) and store them in a location such as the recommended AGA Universal Tool Tray (P/NAGA-SS-UTT) so that they are organized in the order they were removed.



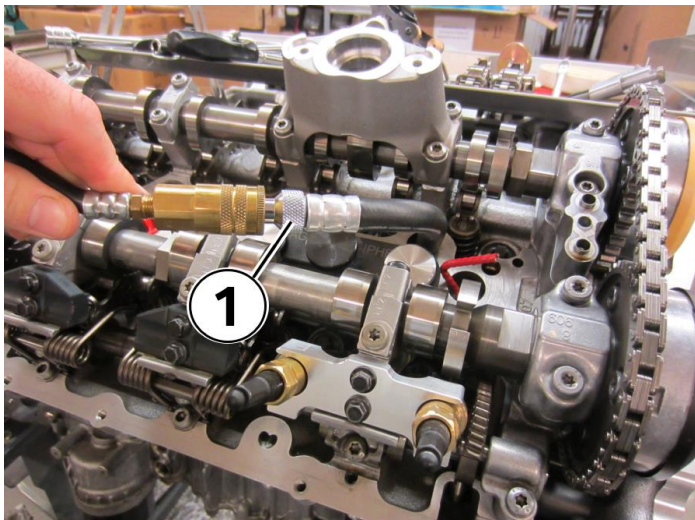
53. The valve springs and valve spring retainers (1) are now exposed.



54. Install compression bracket (1) P/N AGA-N63TU-ICB and both compression rods (2) P/N AGA-N63TU-CR at the same time. Make sure the compression rod is centered over the spring retainer.

**Cylinder 1 and Cylinder 5 Important Note:**  
It is important that both compression rods are installed at the same time with the compression bracket to avoid double work due to the close proximity to the VVT gear. This same technique can be applied to all cylinders to reduce time.

Install both of the VVT spring block screws (3) and hand tighten them.

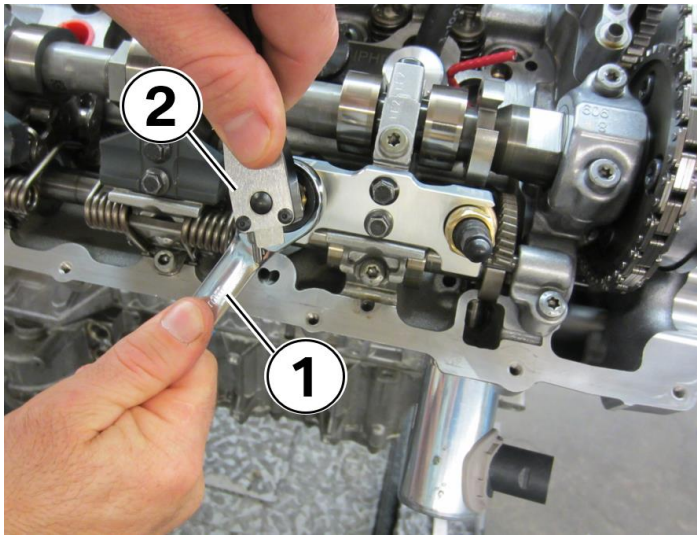


55. Connect the leak down test adaptor (1) to the leak down tester.

Use a cylinder leak-down tester to supply air pressure to the cylinder. The air pressure will hold the valves in the closed position while removing the valve spring retainer, valve spring, and keepers.

A leak-down tester already has a predetermined pressure, so that no damage occurs to the engine.

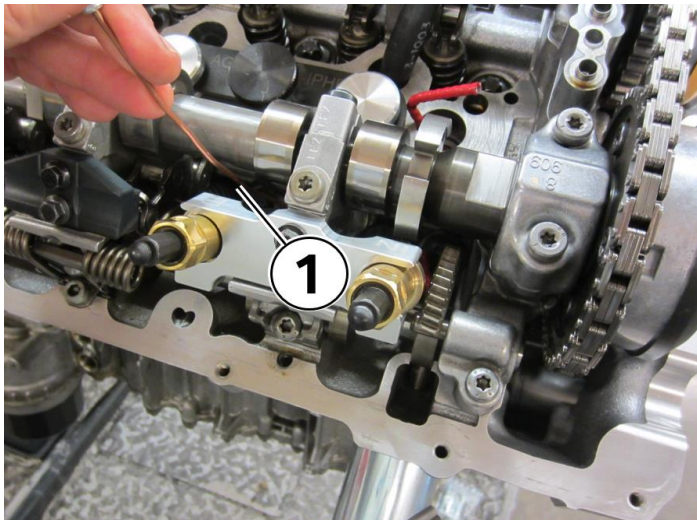
**Never apply shop air directly to the cylinder.**



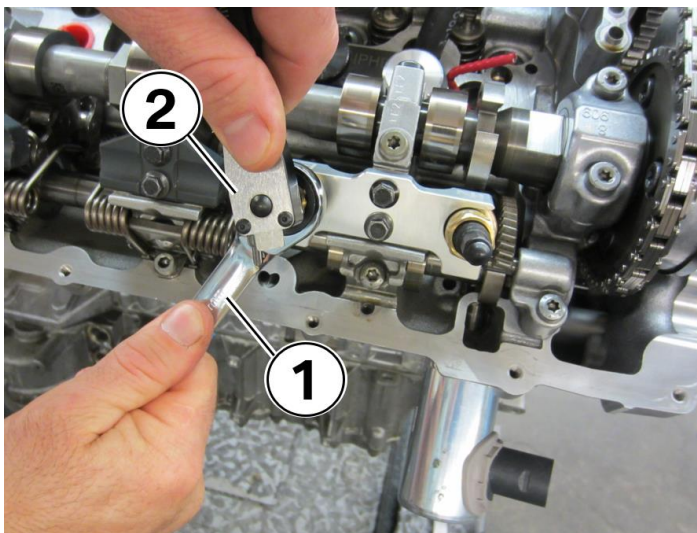
56. Rotate the compression nut counter clockwise with the ratchet (1) until the compression rod compresses the valve spring.

Hold the locator handle (2) firmly to keep the compression rod properly centered on the valve spring retainer.

Repeat this process on the adjacent valve spring.



57. Remove the keepers from both valve spring retainers using a small magnet (1).

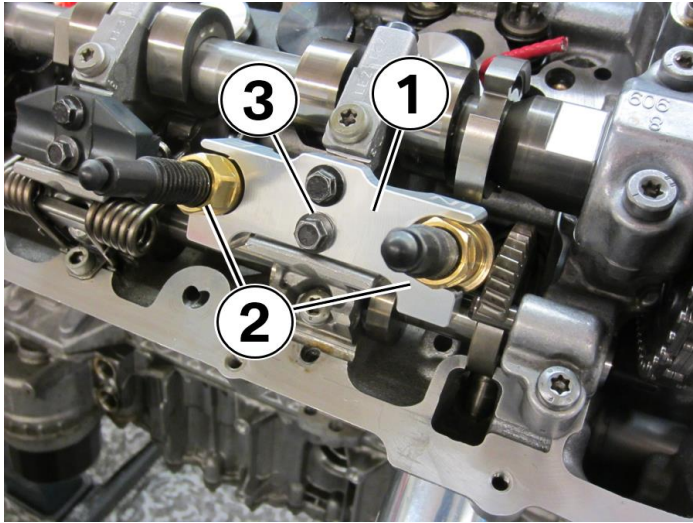


58. Rotate the compression nut clockwise with the ratchet (1) until the compression rod releases the valve spring.

Hold the locator handle (2) firmly to keep the compression rod properly centered on the valve spring retainer.

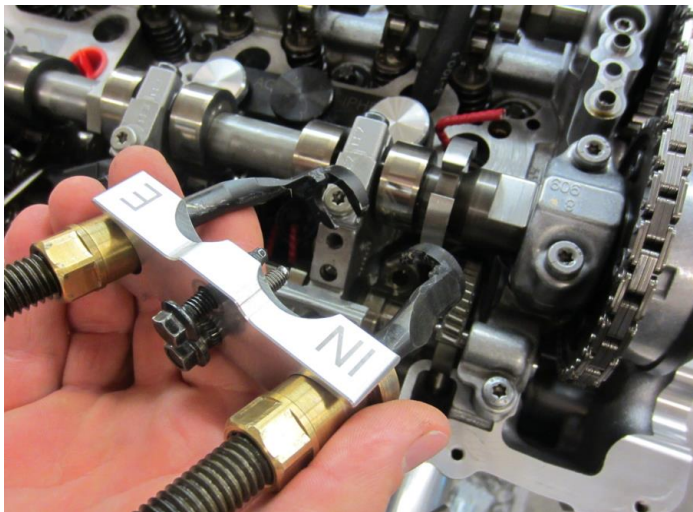
Repeat this process on the adjacent valve spring.





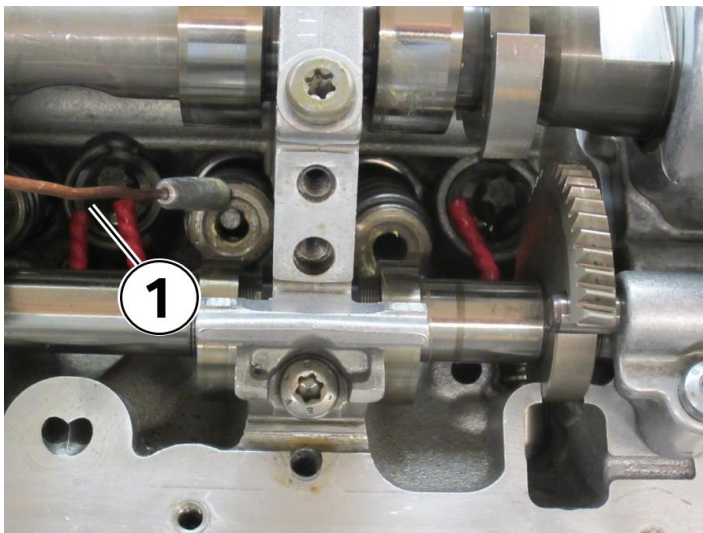
59. Remove the compression bracket (1), compression rods (2) and VVT spring block screws (3).

Removing these items will make it much easier to remove and install the parts in the following steps.



60. Try to remove these components as an assembly as shown in the illustration.

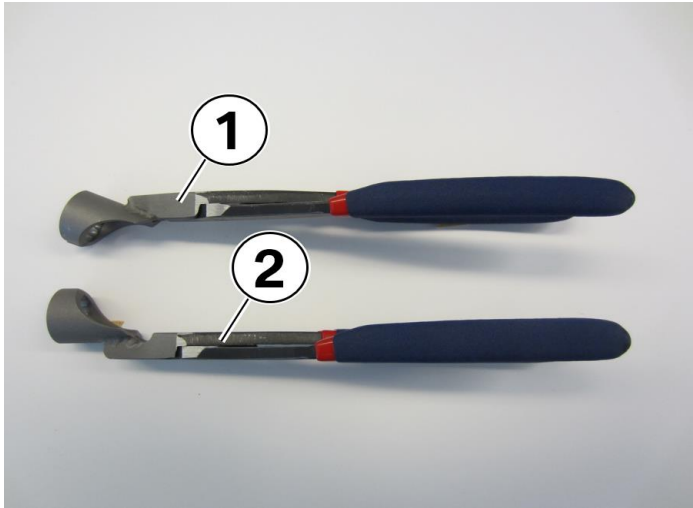
This will make the reinstallation easier.



61. The valve springs and the valve spring retainers are now exposed.

Use a magnet (1) to remove the springs and the retainers.

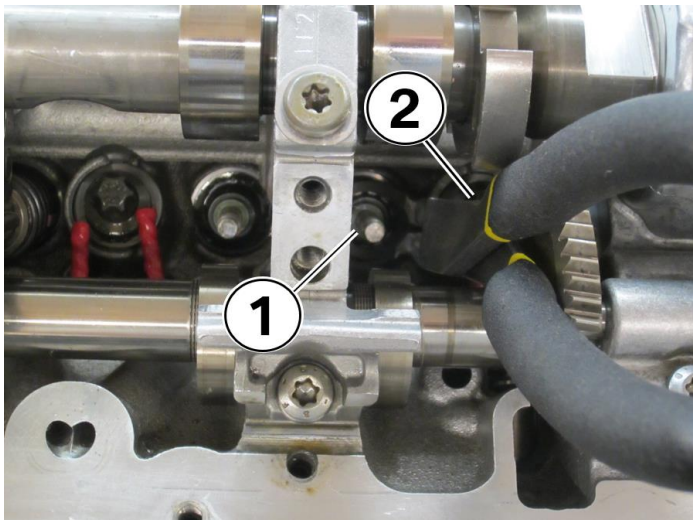
Store them in a location such as the recommended AGA Universal Tool Tray (P/NAGA-SS-UTT) so that they are organized in the order they were removed.



Valve Seal Plier Overview:

Angled valve seal pliers (1) P/N AGA-VSPA – All exhaust valves and intake cylinders 2, 3, 4, 6, 7 and 8 only.

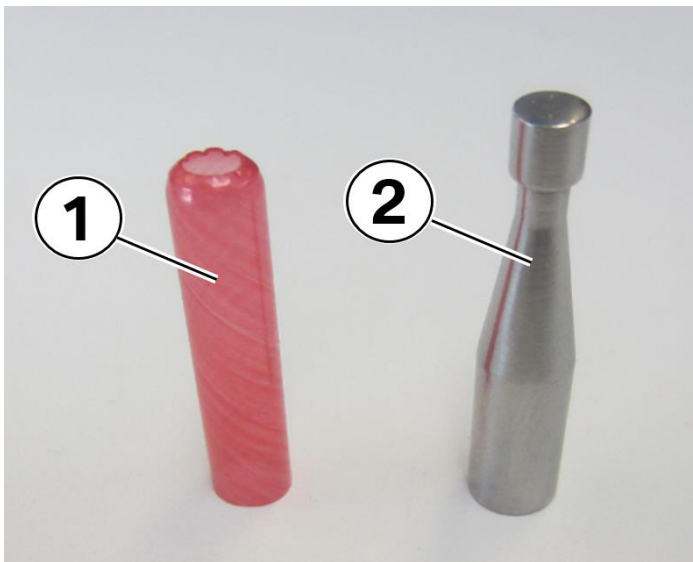
Strait valve seal pliers (2) P/N AGA-VSPS - Cylinder 1 and 5 intake valves only due to the VVT gear interference.



62. Remove the valve seals (1) with the strait valve seal pliers (2) included in the kit.

Repeat this process on the adjacent valve.

P/N AGA-VSPS

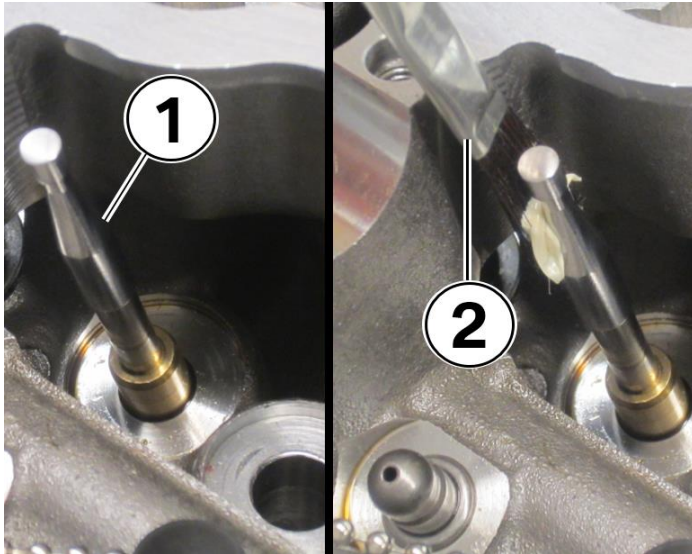


63. Installing the new valve seal can be done using either of these tools.

Valve stem protection sleeve (1) included with every valve seal kit P/N 11 34 0 039 494.

Or

Valve stem seal installation tool (2) P/N AGA-N63TU-VSIT that was provided with the tool kit.

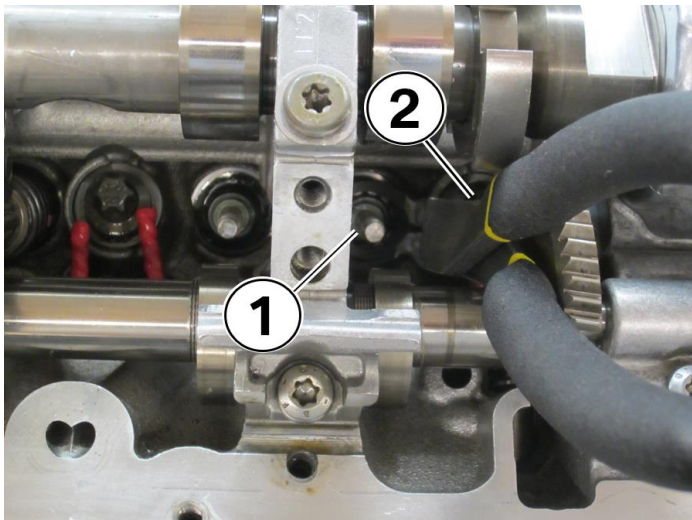


64. For this demonstration we will use the valve stem seal install tool (1) P/N AGA-N63TU-VSIT that was provided with the tool kit.

Apply a light coating of white lithium grease (2) to the tool exterior to help lubricate the valve seal installation.

Use a small magnet to remove and install the valve stem seal installation tool.

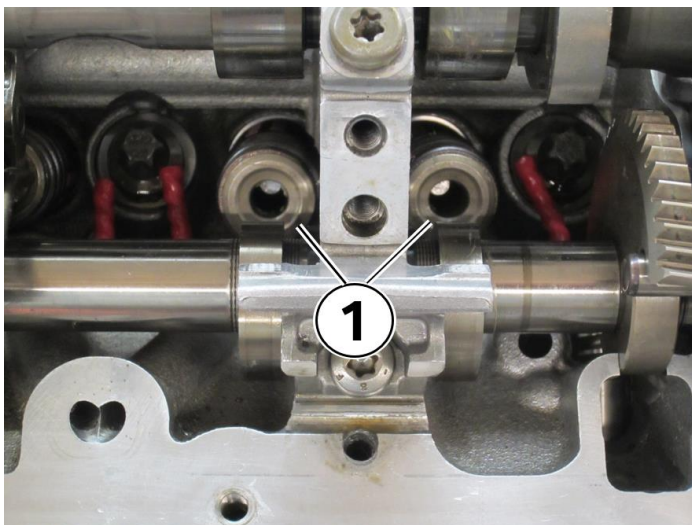
Repeat this process on the adjacent valve spring.



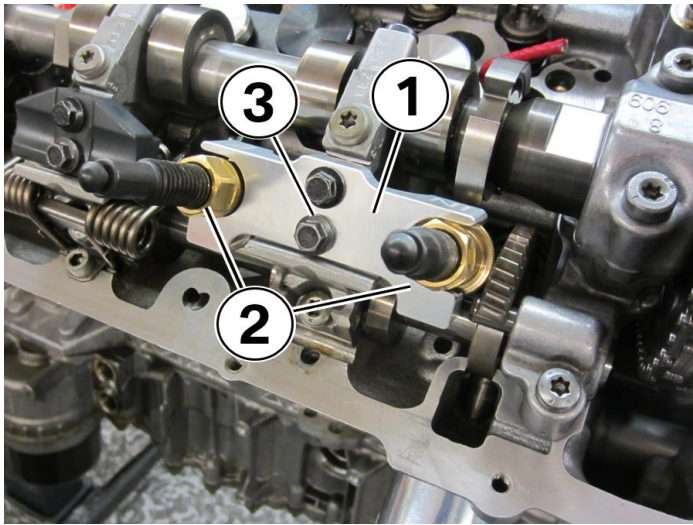
65. Install the new valve seal (1) with the strait valve seal pliers included in the tool kit (2).

Push firmly to seat the valve seal.

Repeat this process on the adjacent valve.



66. Reinstall the valve spring retainers and valve springs (1).



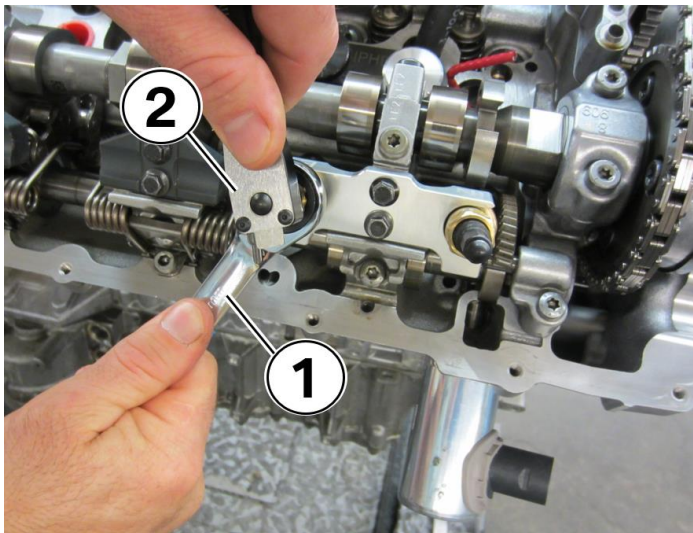
67. Install the compression bracket (1) and both of the compression rods (2) at the same time.

It is important that both of the compression rods are installed at the same time to avoid double work as described in step 54.

**Cylinder 1 and Cylinder 5 Important Note:**

It is important that both compression rods are installed at the same time with the compression bracket to avoid double work due to the close proximity to the VVT gear. This same technique can be applied to all cylinders to reduce time.

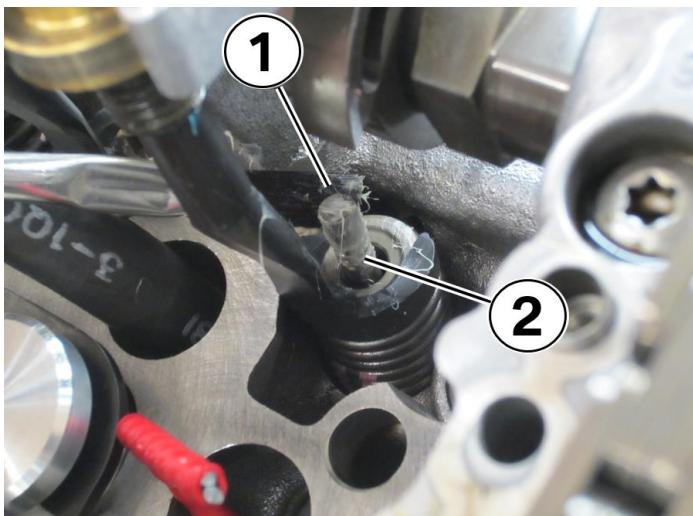
Install both of the VVT spring block screws (3) and hand tighten them.



68. Rotate the compression nut counter clockwise with the ratchet (1) until the compression rod compresses the valve spring.

Hold the locator handle (2) firmly to keep the compression rod properly centered on the valve spring retainer.

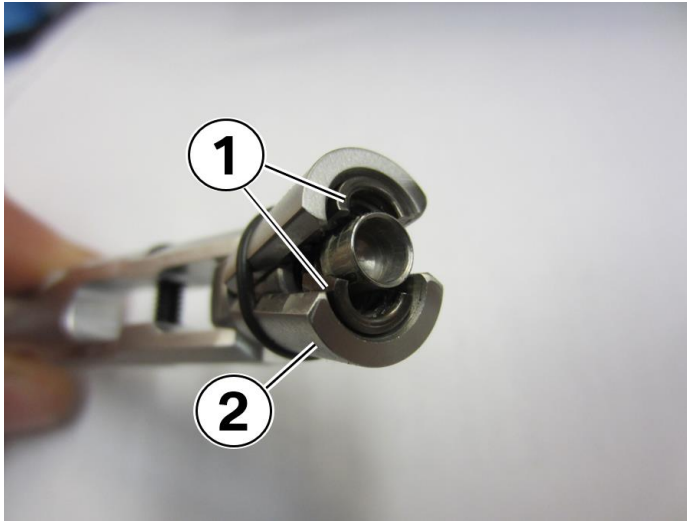
Repeat this process on the adjacent valve spring.



69. When the valve stem is exposed (1), apply a small amount of white lithium grease to the keeper grooves only (2) with a brush to assist in holding the keepers in place.

Excessive grease can interfere with the installation.

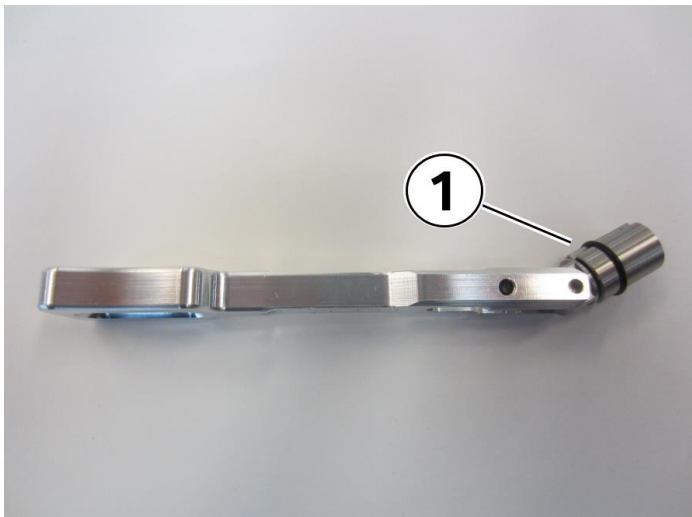
Repeat this process on the adjacent valve spring.



70. Install the keepers into (1) the intake valve keeper installation tool (2).

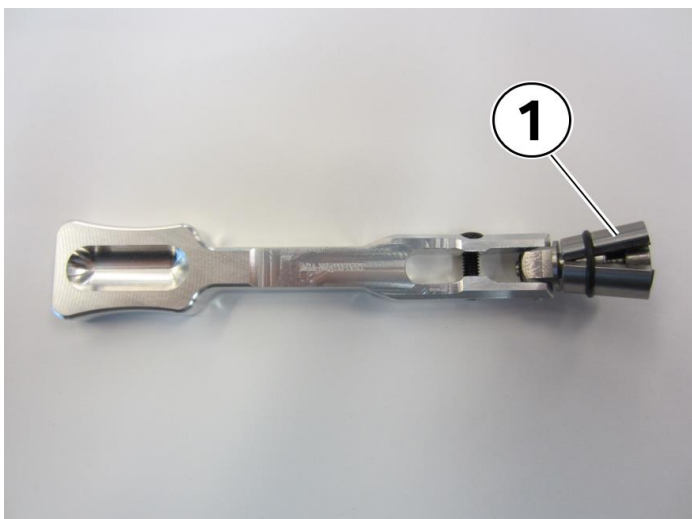
Make sure the taper of the keepers are facing in correct direction.

P/N AGA-N63TU-IVKT



71. With the keepers in the keeper installation tool adjust the angle (1) on the tool similar to the illustration. This angle is approximately 20 degrees.

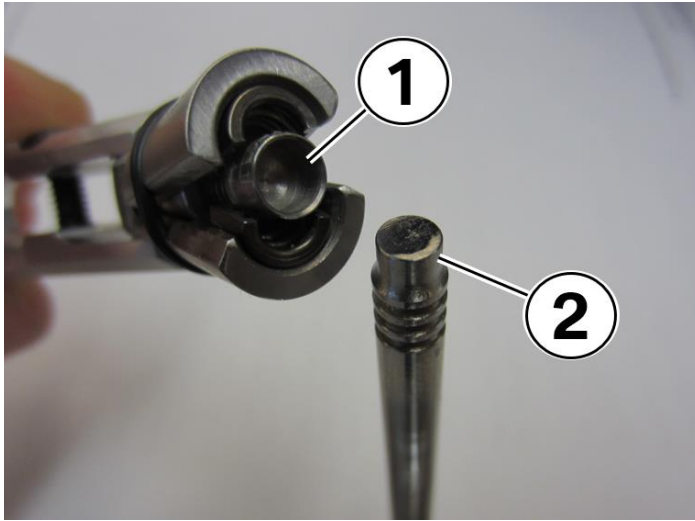
This angle will be the generally the same for all of the intake valves.



72. Lay the keeper installation tool flat as shown in the illustration.

Rotate the tip (1) of the tool similar to the orientation in the illustration.

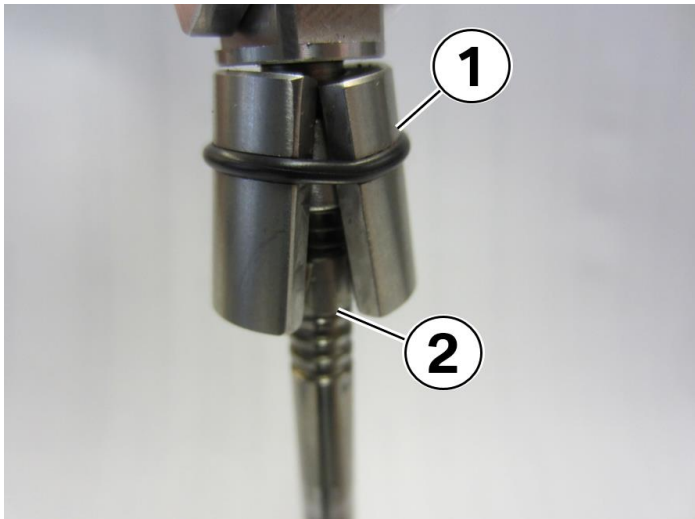
The gap (1) between the two halves of the keeper tool should be facing up.



73. For clarity the next four steps are shown outside the engine.

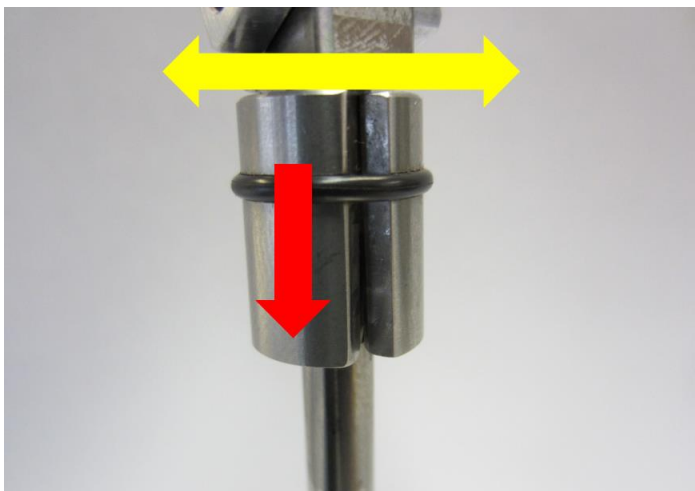
The operation of this keeper tool is different than the exhaust tool.

The end of the tool has a machined hole (1) to fit the top of the intake valve (2). It must fit squarely before pushing downward to install the keepers.



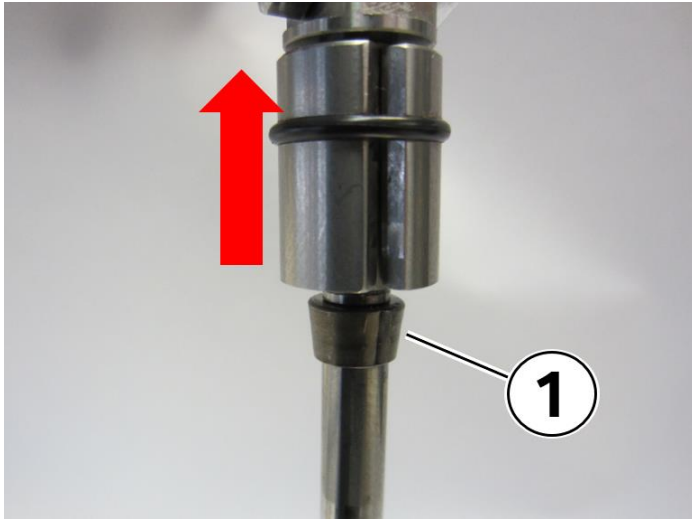
74. Gently place the keeper installation tool (1) on top of the valve (2) until the machined hole in the tool has mated with the valve stem.

Excessive grease can interfere with the installation.

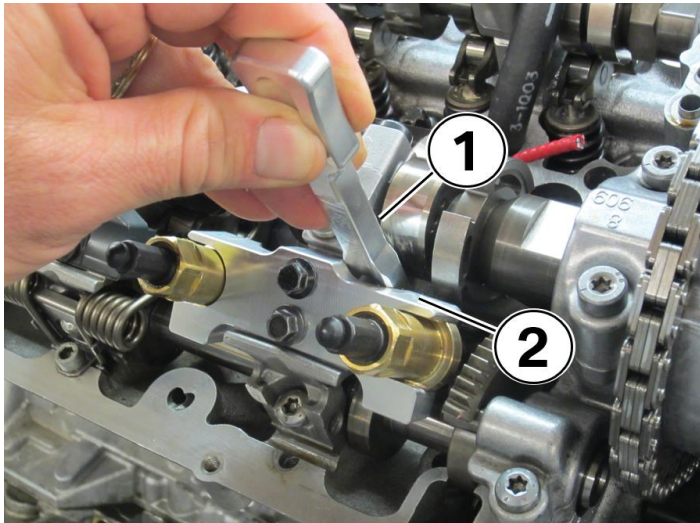


75. Push downward in the direction of the red arrow until it stops.

Gently rock the tool side to side in the direction of the yellow arrow to release the keepers.



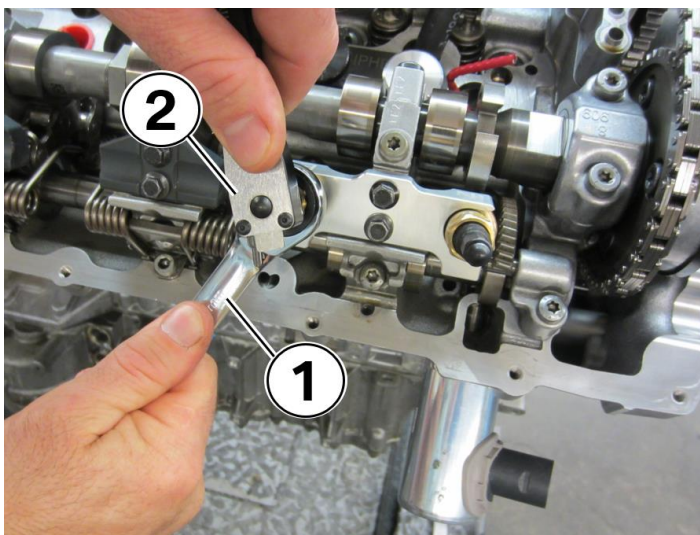
76. Lift the tool gently straight upward in the direction of the red arrow and the keepers (1) will be left behind on the valve stem.



77. When completing this section of the procedure on the engine the keeper installation tool (1) will be inserted between the compression bracket (2) and the camshaft.

Repeat steps 74-77 as needed.

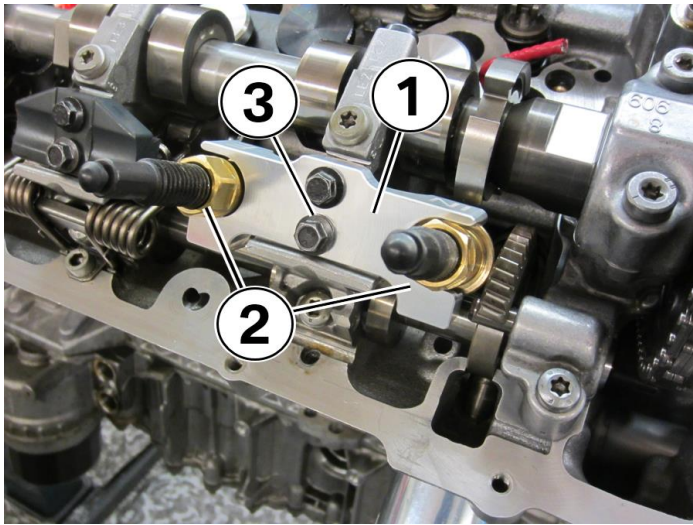
Repeat this process on the adjacent valve spring.



78. Rotate the compression nut clockwise with the ratchet (1) until the compression rod releases the valve spring.

Hold the locator handle (2) firmly to keep the compression rod properly centered on the valve spring retainer.

Repeat this process on the adjacent valve spring.

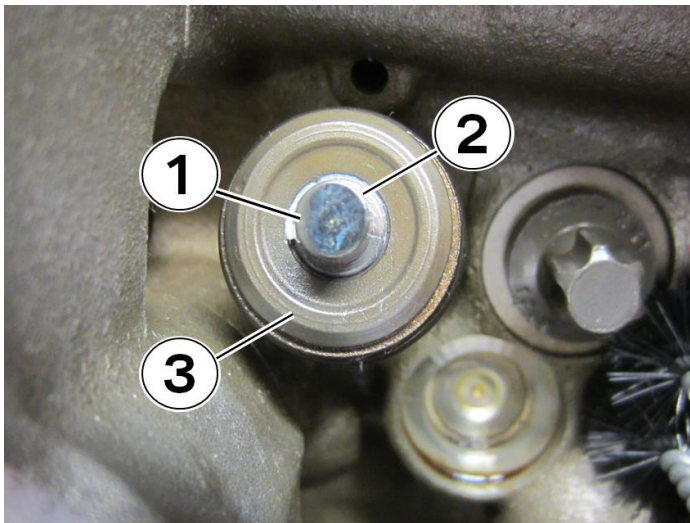


79. Remove the compression bracket (1), compression rods (2) and the VVT spring block screws (3).

Removing these items will make it much easier to remove and install the parts in the following steps.

Try to remove these components as an assembly.

This will make the reinstallation easier.

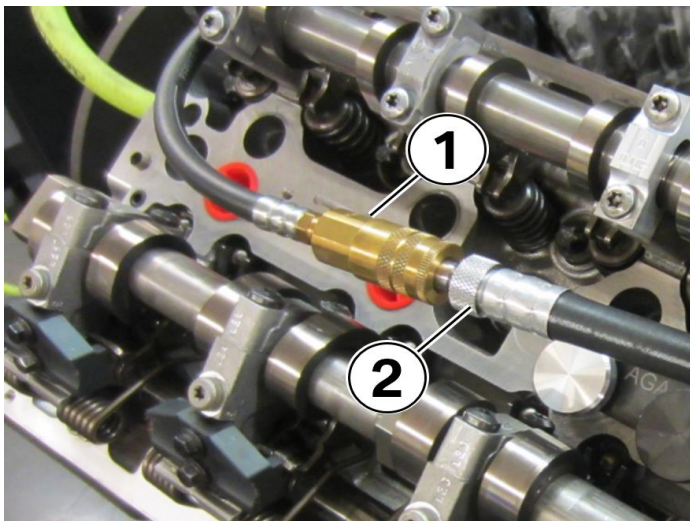


80. Wipe away the excess grease.

Inspect the valve stems (1), keepers (2), and the spring retainers (3) for the proper alignment before continuing.

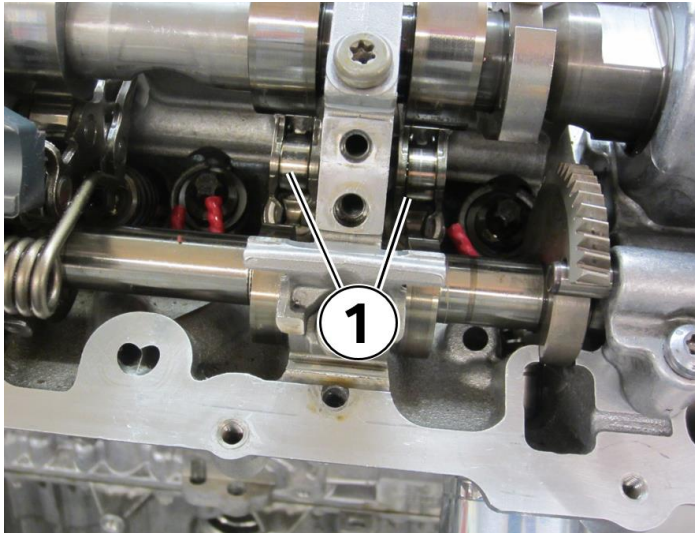
If the alignment is not correct, you will have to repeat steps 69-81.

Repeat this process on the adjacent valve spring.



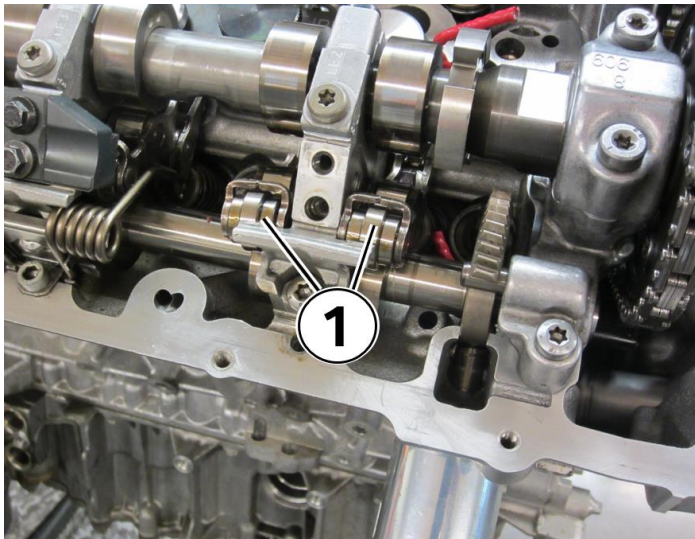
81. Disconnect the leak down tester (1) and remove the leak down test adaptor from the cylinder (2).



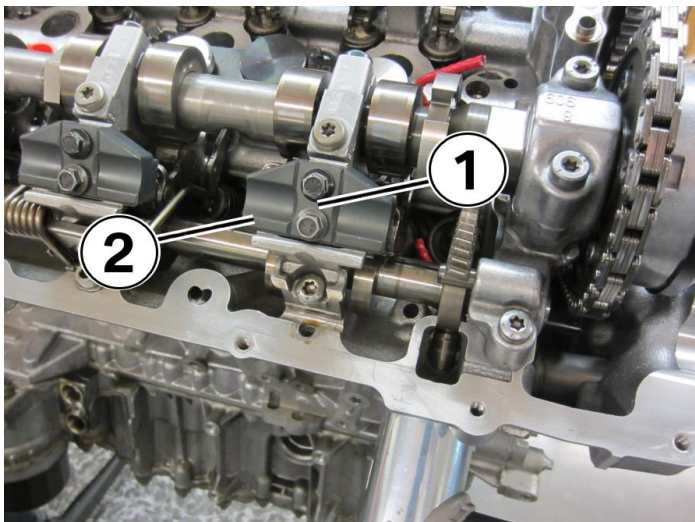


82. Install the rockers.

Be sure they are correctly installed on the valve stem and lifter.

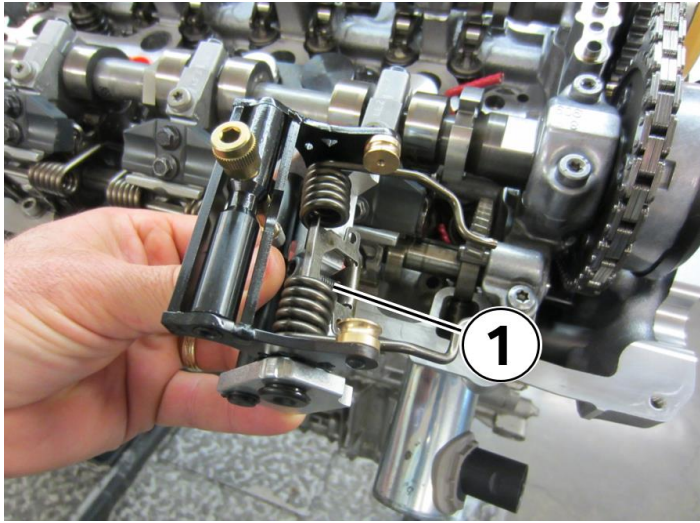


83. Install the intermediate levers.

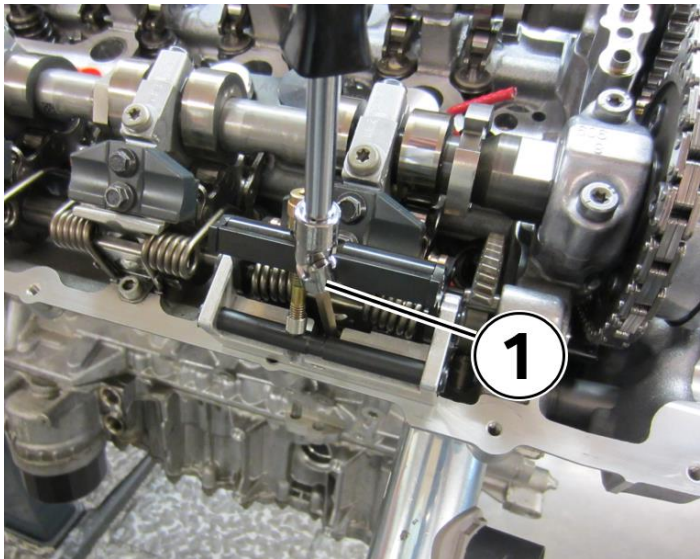


84. Install the VVT spring block and it's mounting screws.

Torque the screws (1) to 10 Nm.



85. Reinstall the VVT spring with the VVTS spring compressor tool.

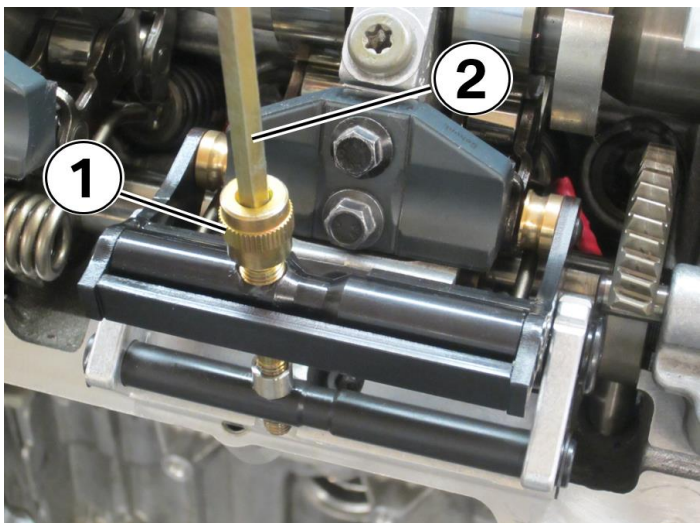


86. Tighten the spring retaining screw (1) by hand using the 5mm universal Allen socket.

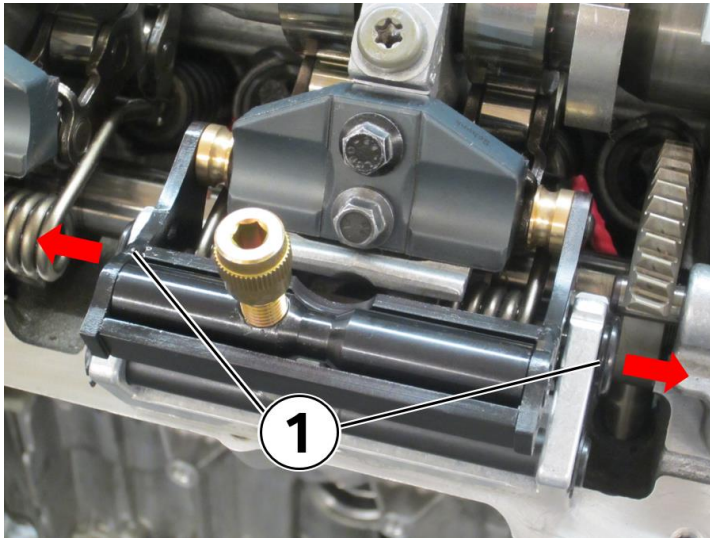
Note: The VVTS tool has an integrated magnet to secure the spring retaining screw so that it is not misplaced.

Do not use power tools.

Torque the M6 spring retaining screw to 8 Nm.

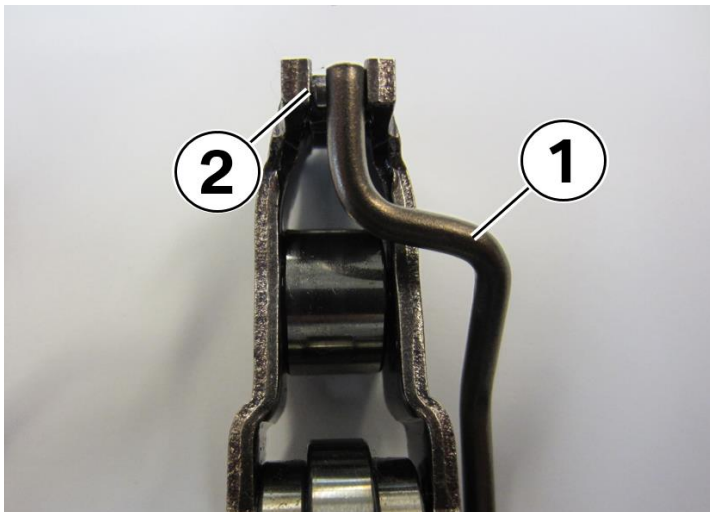


87. Release the tension on the VVT spring by turning the screw (1) counter clockwise with the 5mm universal Allen tool included in the kit (2).



88. Pull the VVT spring retainers (1) outward in the direction of the arrows.

Remove the tool from the engine.



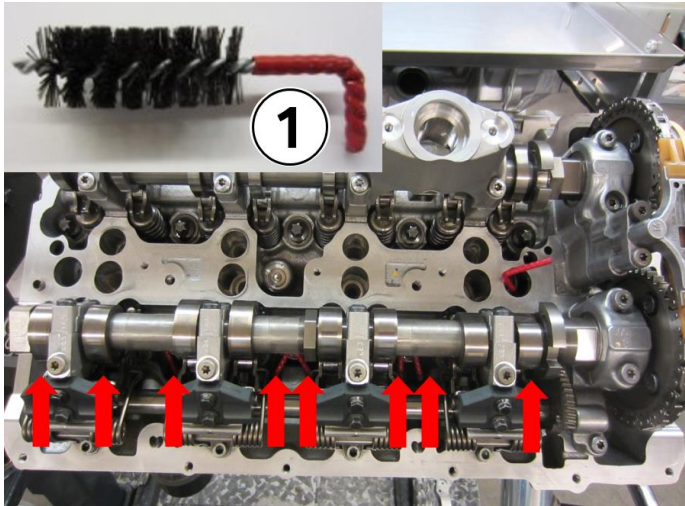
89. For clarity this illustration is shown outside the engine.

Inspections must be made using a small mirror and a flashlight.

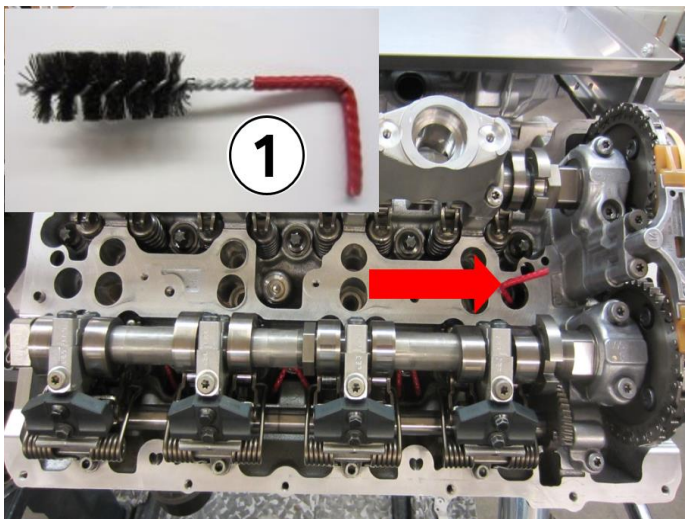
Inspect the VVT spring (1) position on the intermediate lever. The spring must be inside spring groove (2) located on the underside of the intermediate lever.

**Repeat steps 16 – 90 for the remaining cylinder valve seals on cylinder head Bank1.**

**Repeat steps 6 – 90 for Cylinder Bank 2.**



90. Don't to forget to remove the eight plug brushes (1) in oil drain back holes (see arrows) in the cylinder head.



91. Don't to forget to remove the plug brush (1) in oil drain back hole to the timing chain cavity (see arrow) in the cylinder head.

92. Reinstall the cylinder head covers and fuel injection system as per Repair Instruction 11 12 005 "Removing and installing/sealing left cylinder head cover" and 11 12 006 "Removing and installing/sealing right cylinder head cover"

93. Reinstall the engine and front axle as per Reassemble vehicle as per repair Instruction 11 00 598 "Removing and installing engine on front axle (N63O1) with GA8HP70Z all-wheel drive vehicle transmission"



94. Before starting the engine for the first time perform engine oil priming procedure.

1. If the engine has been drained prior to the repair remove the engine oil drain plug again to remove any residual oil that may have settled in the engine oil pan during the repair if the engine oil pan was not removed entirely.
2. Reinstall and torque the engine oil drain plug (with a new seal ring) per the applicable repair instruction.
3. Remove the oil filter housing cover and verify the oil filter is present. Reinstall the oil filter housing cover and torque it to the proper specification noted in the applicable repair instruction.
4. Fill the engine with the proper type and amount of engine oil, as specified in the applicable repair instruction.
5. Connect a battery charger to the vehicle.
6. Remove the electric fuel pump fuse. Refer to the applicable wiring diagram using the VIN number of the vehicle in ISTA/D.
7. Crank the engine for 10 seconds.
8. After 10 seconds have elapsed, stop the starter, and allow the starter to cool for 20 seconds.
9. Repeat steps 7 and 8 two additional times.
10. Reinstall the electric fuel pump fuse and start the engine. Verify proper engine operation.
11. After the engine has reached operating temperature, check the engine oil electronically or with the dipstick, and top up the engine oil as needed.
12. After the engine has reached operating temperature, check the engine oil electronically or with the dipstick, and top up the engine oil as needed