BEW cam and lifters replacement procedure by 'zanzabar' – Jay Roberts, Petaluma, CA. (modified from engine timing belt replacement procedure from MOGolf as demonstrated on a 2004 Jetta).

Required tools are:

Complete timing belt toolkit: serpentine tensioner locking pin, crank locking tool T10050, timing belt tensioner locking pin, 19mm 12 point socket, camshaft locking pin, and timing belt tensioner pin tool (6mm allen wrench). You will also need a set of 12 point triple squares, specifically the M8 and M10.

Parts list:

Tandem pump gasket (1), cam pulley bolts (3), BEW Camshaft 038 109 101 R, 8 x BEW Cam Follower 038 109 309 C, 10 x BEW Camshaft Cam Bearing Cap Bolts 038 103 714, 8 x BEW/ BRM Rocker Arm Shaft Bolt 038103 714 A, 5 x BEW/ BRM Camshaft Bearing sets 038-103-6730B-GLB, oil, oil filter, engine assembly lube.

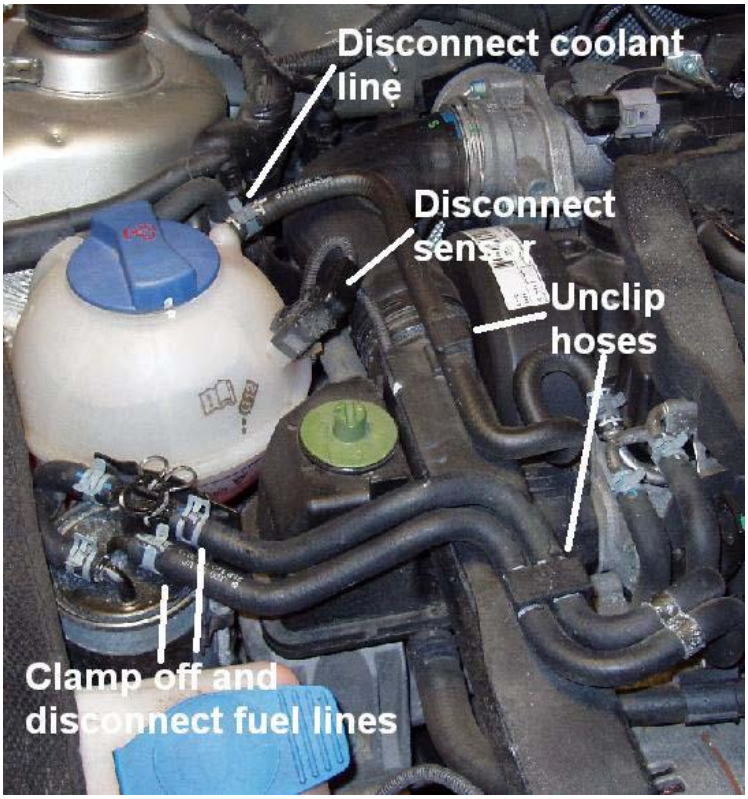
Optional:

Oil Cooler 068 117 021 BMY, Oil Cooler O-Ring,Outer (at Cover) 038 117 070, Oil Cooler O-Ring Inner; at Housing 038 117 070 A, Dirko Sealing Compound UN 125 3000 (Hylomar oil pan sealant).

IF you don't replace the timing belt as part of this job, you won't need an engine hoist or means of supporting the engine from below. That's how this procedure works. After the replacement is complete and the engine starts and runs well, an oil pan cleaning and oil cooler cleaning or replacement is recommended. Not before the new cam is installed and the engine started, otherwise the new parts will be dry and there will be a much longer period of time when no oil is supplied to the top end = large potential for wear/damage.

Step 1 – opening up the top side

Start by opening up the area to the left of the valve cover, remove the intake flex pipe, and various coolant hoses. Then disconnect the sensor and hoses connected to the solid intake pipe.

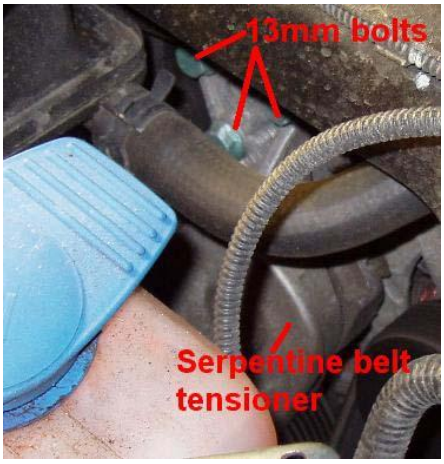


You do not need to disconnect the fuel filter hoses or the coolant bottle, but it is helpful to remove the 5mm hex bolt that holds the power steering reservoir in place.

Unclip the rigid pipe from behind and below the right headlight, thus removing the entire rigid pipe and hose the entire distance from behind the headlight to the EGR valve.

Next loosen the serpentine belt tensioner and clamp it in the open position. Use a 16mm open end wrench/spanner, or adjustable wrench, on the tensioner tab. Pull towards the front of the car. **Caution:** This is a strong spring mechanism. Insert a locking pin or a 4mm allen wrench or other tool through the holes and remove the wrench. Then slip off the serpentine belt from the tensioner. In the pictures below I have shown the VW tool T10060 and the Metalnerd locking pin.

Now remove the three bolts securing the tensioner with a 13mm socket wrench, and remove the tensioner.



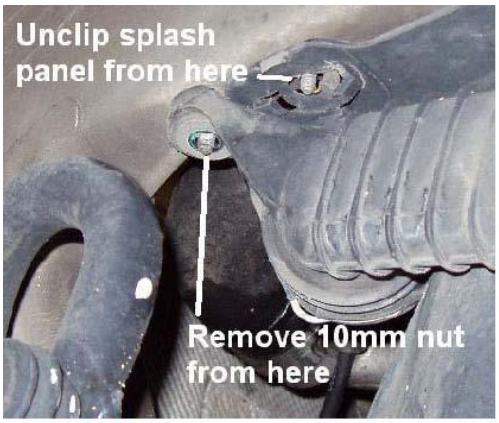
Unclip and remove the top timing belt cover. It's an obvious step so I didn't picture it.

Loosen the three 5mm bolts that link the EGR to the intake manifold. Now is a great time to take some diesel fuel or other solvent and clean that baby out! Also remove the butterfly valve from the manifold.

Step 2 – timing belt work

It's necessary to have easy access to the lower passenger side of the engine, so removing the passenger side front wheel is a good idea. Loosen the lug bolts from the right front wheel, raise the front right corner of the car, and support with a jack stand. Then remove the under-engine sound deadening panel and right front wheel (T-25 torx screws).

Next remove the lower intake pipe by removing a 10mm nut, unclip the pipe from the rear (just above "10mm" in the picture) and front connecting locations, then pull out.



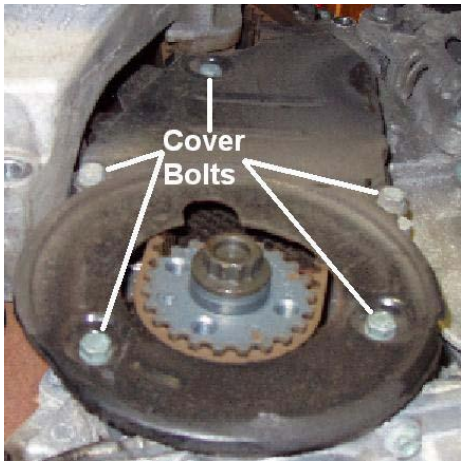
Remove the side splash panel by inserting an appropriate pry tool between the panel and car body at the rear clip and pry it off of the stud. Then work towards the front of the car and unclip the panel from above the front intake pipe connection. Maneuver the panel out from under the car.

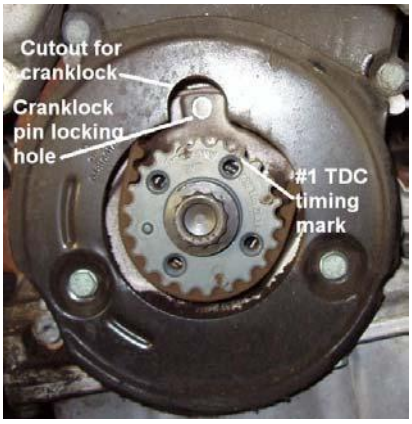
Slip the serpentine belt off of the crank pulley. It can be left more or less in place but be sure to work carefully around it.

Remove the cover over the vibration damper/belt pulley bolts. Insert a flat screwdriver (or other suitable tool) all the way between the cover and pulley then pry out the cover. It's easier than trying to pry directly on the edge of the cover.

To remove the damper you will have to counter hold the crank with a 19mm 12-point socket and breaker bar, while using a 6mm hex bit socket on the bolts. These are fairly snug and may take some effort to remove. If hard to remove use an Irwin Bolt-Grip, or Sears Craftsman Bolt-Out, to remove. If this is the second timing belt replacement, plan on replacing the bolts.

This will give you good access to the lower belt covers and lower bracket bolt (already removed in the picture above). Remove the lower and center belt covers. These are secured by five 10mm head bolts. The covers have a sound deadening material bonded on the inside. Do not scrape it off while removing worn off belt dust.





Rotate the engine **clockwise** until the timing mark on the crank pulley is near the alignment pin locking location. The picture above was taken before the cover was removed and the engine needed to be turned nearly a full rotation.

At this point look for the cam locking pin hole aligning properly. Use a mirror to find the hole and insert the pin by wiggling it forcefully. It will take some effort. You might get the hole nearly right by turning the crank and then "fine tune" by using a 18mm socket on the cam bolt to vary the cam back and forth until the pin goes into the hole. If the hole is not visible, rotate the crank one more full revolution until the cam pulley is oriented like the picture below.

Once the cam is locked, return the crank and turn it until the crank lock inserts into the locking hole. It should not take much, if any. The crank lock slides onto the teeth of the pulley. Do not just lay it on top of the pulley. With everything right, the alignment marks mate up. The knob is removable from the T10050.

From above, loosen the tensioner bolt (but don't remove) and use the tensioner tool (or 5mm allen wrench) to adjust (loosen) the tensioner counter clockwise until the tension is released from the timing belt. If it's loose enough, slide it off of the crankshaft pulley, and then off of the cam. Again, be careful to work around the belt and not damage it. If your belt is due for a change, now would be the time to do it! Follow MOGolf's timing belt R&R instructions.

Step 3 – Top end disassembly

The cam and crank are now locked in at #1 TDC. The purpose of this is to make sure everything fits prior to disassembling the valvetrain. Remember what this looks like, it's what you want to see during reassembly.

Loosen the 10mm bolts that hold the valve cover to the head. These are captive bolts that are connected to the valve cover, so don't try to pull them all the way out. Remove the valve cover.

Remove the two 6mm and two 5mm hex bolts that hold the tandem pump to the head. You will probably want to replace the gasket as well. You are now looking at the injectors, bearing caps, cam, and lifters.

Loosen the M10 triple square bolts on the injector rocker shafts and remove…keep them in order! Loosen them slowly and evenly. They will come out in two pieces, four bolts each. Remove the cam locking pin, and the cam pulley. Use a special gear puller, carefully hammer on the pulley, or use your imagination to get it off. If it doesn't come off easily, don't worry about it. Make sure the belt is off the pulley and start working on the bearing caps.

Use the M8 triple square to loosen the bearing cap bolts. Loosen them slowly and evenly. (Keep them in order, they have to go back on exactly where they came from!) The cam can be

removed once all the caps are off. If you weren't able to get the pulley off the cam previously, then you can now work on it on the workbench. Place the pulley inbetween the arms of a vice, or other apparatus, loosen the cam pulley bolt, and rap the bolt with a hammer a few times to dislodge the cam from the tapered fitting on the pulley.

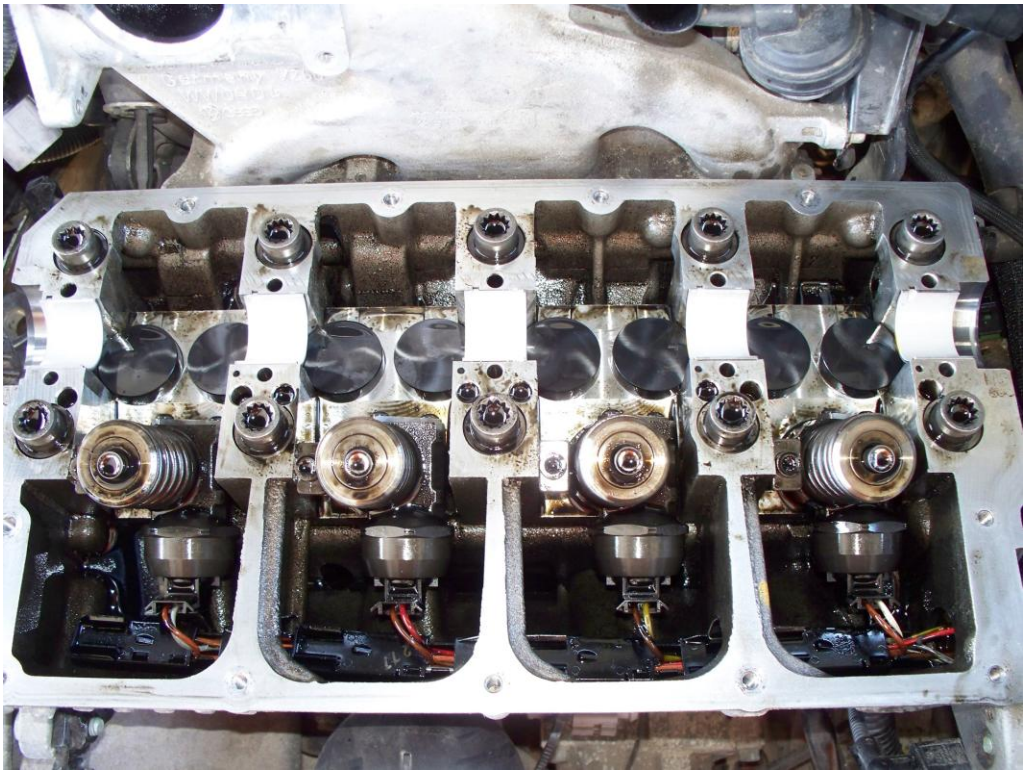
Now the old bearings and lifters are exposed. Pry the bearings loose carefully with a screwdriver. Then gently pull the lifters out with pliers. Here are the parts removed, kept in the correct cylinder order (left to right) for reassembly.

On my car, the bottom bearings were very well worn, through at least three distinct layers of metal. The lifters all had circular patterns of wear at the center of the friction surface, but did not look very close to failure. And in fact, only one pair of cam lobes (cylinder 1, farthest left) were significantly worn. The upper bearings were in ok shape, only the one closest to the tandem pump was really bad. Here's a picture of the worst bottom bearings, the bad cam lobes (in higher resolution you can see that the chamfer is worn off), and the cylinder 1&2 lifters.

Step 4 – topside reassembly

Now remove the crank lock and turn the crank counterclockwise to 90 degrees back from TDC. This will move the pistons to mid stroke so the valves won't hit them when you install the new cam. With the crank turned back 90 degrees, all four pistons will be half way up (or down) the bore.

Install the new lifters and bearings into the head. Make sure to apply lots of assembly lube to all the new parts you put in. Take care also to keep dirt and debris out. The bearings have a notch to ensure proper alignment. Press them in the sleeves so that both ends are flush with the surfaces of the head.



Also install the bearings into the bearing caps in preparations for bolting down the cam. Install the new cam with the lobe closest to the timing belt pointing to the front of the car (the two lobes closest to the belt will appear to be flat). Don't forget the new cam seal on the belt end of the cam, and put the pulley back in place. There is a notch on the cam to align it properly.

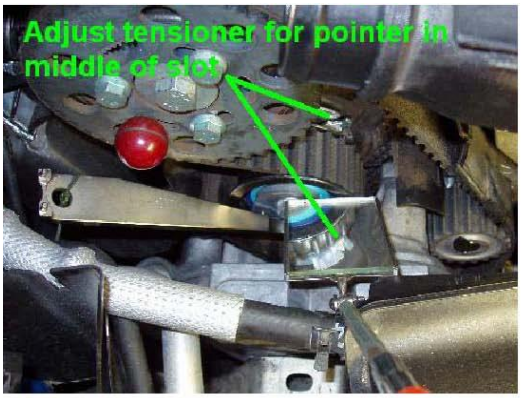
Install the bearing caps in the same order they were removed. Tighten the bolts evenly, starting from the middle and working outwards. Tighten them all to 6 ft lbs, then add another ¼ turn in the same order. Finally, put the rocker arms back in place and tighten the bolts in a similar fashion to 15 ft lbs + ¼ turn. Don't forget the assembly lube on everything!

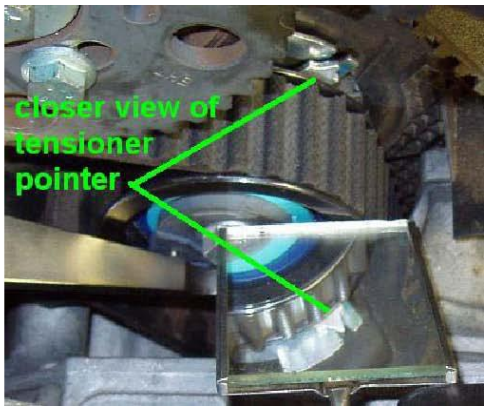
The cam lock tool should fit, if not rotate the cam slightly until it does. Don't forget to use the mirror! Rotate the crank back to TDC and install the crank lock. With the cam tightened down and locked in place TDC #1 when you crank the engine back to TDC 1-4, #1 valves are closed and #4 valves are in the transition between the exhaust valve closing and the intake valve opening. #2 and 3 you don't need to worry about because the piston is down. Since the cam is locked in place, you can bring the crank up to TDC without hitting the valves. The valves on #2 will be closed as you turn the crank back to TDC #1 since it is coming down on firing and #3 will have the intake valve open because it is coming down on intake.

Once the cam is installed, pour enough of the proper synthetic oil (or assembly lube, or special lubro-moly additive, etc.) all over it to coat it before starting the engine.

Step 5 – timing belt reassembly

Get the tensioner set right by using the tool or 6mm allen wrench to align the pointer and then tighten the nut.





Tighten the cam pulley bolts to 18 ft-lbs (25 Nm). Remove the cam locking pin, and the crank locking tool.

Using a 19mm 12 point socket on the crank bolt, rotate the engine clockwise at least 2 rotations. This is supposed to validate that the valves won't hit the pistons, but they were locked in position so they won't be hitting. Once you're confident everything is together correctly, install the tendem pump with new gasket, the valve cover, and EGR.

Install the lower timing belt covers. The bottom of the upper cover installs over the top of the lower cover. Tighten the five 10mm bolts to 15 ft-lbs (20 Nm).

Install the crank serpentine belt pulley. Note that the small nub on the crank pulley will seat into a hole on the serpentine belt pulley. Counter hold the crank with a 19mm 12 point socket while tightening the four 6mm hex bit bolts to 7 ft-lbs (10 Nm) plus ¼ turn.

Install the serpentine belt tensioner. Tighten the 13mm head bolts to 18 ft-lbs (25 Nm). Route a new serpentine belt around the crank pulley, power steering pump, AC compressor and alternator making sure the belt is properly seated in the grooves. Use a 16mm open end wrench, adjustable wrench, or whatever you used on the serpentine belt tensioner before, to apply pressure on the tensioner. Remove the locking pin and gradually let the tool move towards the front. The tensioner will now apply the appropriate pressure to the serpentine belt.

Install the lower intake tube, making sure the clips are fully seated and the tube cannot be pulled back out. Secure with the 10mm nut on stud. Return to the engine compartment and install the upper intake components and miscellaneous hoses removed earlier. Do not install the clamp at the rubber coupling to rigid pipe joint with the tabs on top. The tabs must be on the bottom, or moved to the engine side. If positioned on top, they will chafe the coolant hose. Install the 5mm internal hex bolt to secure the power steering reservoir.

Make sure everything else is put together and ready to run!

Step 6 - startup

1) Bump the engine starter to rotate the engine around a couple times without actually starting it. I do this because I'm paranoid. If nothing seized up that's good. Crank it up and get it running, once it catches run it for at least 5 minutes at 2k rpms. Mine did not start until I cranked it for about 30 seconds. ☹ I don't know why, I didn't open the fuel lines.

2) I did not change the oil prior to this job because I wanted the oil system to be primed and ready to provide oil to the head as soon as possible. I really don't think you want to dry start the engine after this kind of job. After the engine runs for awhile and seems ok, then change the oil right away. You'll probably want to change it again within 500 miles or so. It may also be a good idea to clean out the oil pan and oil cooler, especially if you've had a catastrophic failure and suspect that metal fragments are in the system somewhere.

3) Run some ZDDP in the oil also, especially if you're using 505.01 or 507. If you're using Rotella, you'll probably be fine. ☺

Step 7, 8, 9 – beer

Have a beer, then another, step 9 is optional.