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## A guide to testing the injectors on a VW Mk1 Golf GTI

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### NOTE

Before following the procedure in this guide you should verify that all other components of the fuel delivery system - fuel pump, accumulator and lift pump (later Cabriolets) - are working correctly, and that all related filters are clean.

If you find this guide useful, please consider making a donation to the Mk1 Golf Owners' Club (<http://www.vwgolfmk1.org.uk/>)

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You may not reproduce it, or any part of it, without the written consent of the author.

### DISCLAIMER:

I accept no responsibility for any mishaps that may occur if you follow this procedure

## WARNING

IN THE FOLLOWING PROCEDURE THE BATTERY REMAINS CONNECTED.  
OBSERVE ALL SAFETY PRECAUTIONS REGARDING FUEL VAPOUR AND ELECTRICAL SPARKS  
/ SHORTS !!!

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**Injector basics**

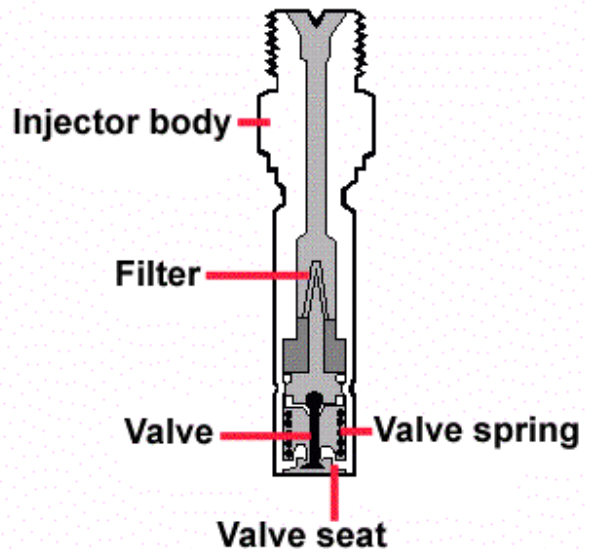
The following web site gives a detailed explanation of the fuel injection system and components:

[http://www.auto-solve.com/mech\\_inj.htm](http://www.auto-solve.com/mech_inj.htm)

The injectors open at approximately 3 bar, and should spray a fine atomised 'mist' of fuel behind the inlet valve, waiting to be drawn in on the induction stroke. The fuel is delivered as a continuous spray, not timed or pulsed as on other systems. When the injector valve seat opens the pressure drops, subsequently closing the injector, which causes the pressure to rise and open the injector again. This cycle causes a vibration, or 'chatter', and helps to atomise the fuel.

When the engine is switched off the fuel pressure drops to below 3 bar, and the injector closes, forming a fuel tight seal, preventing fuel dripping onto the inlet valve.

The spray pattern should be a conical shape, and when clean and working efficiently, the injector should emit a high frequency noise (the 'chatter').



Watch a video of the injector system and listen to the injectors working here:

<http://www.vwgolfmk1.info/main/kjetvideo.mpeg>

or here:

<http://www.taunusfinland.com/tiedostot/ford/K-Jetronic/kjetvideo.mpg>

**Injector**

Note that this is an old injector showing a deformed upper (large) seal, which could cause air leaks into the system. With time this will disintegrate.

**This seal MUST BE REPLACED.**

Some injectors may not have the silver 'top hat' as shown here.

**Injector seat insert and air shroud**

These parts are not normally seen, and sit in the cylinder head.



Injector seat insert, showing the groove for the seal.



**Injector seat insert and shroud with the injector in the fully inserted position.**



### **NOTE**

**Before following the procedure in this guide you should verify that all other components of the fuel delivery system - fuel pump, accumulator and lift pump (later Cabriolets) - are working correctly, and that all related filters are clean.**

### **Equipment Required**

**4 x Worcester Sauce bottles (remove the plastic tops and ensure they are clean and dry)**

**4 x broom clips**

**4 x screws**

**1 x suitable length of wood**



The bottles can be marked, as shown, to get a more precise measurement of fuel flow later in the test.

The difference between maximum and minimum delivery between injectors should not exceed 15%.

I used an ink-jet printer refill syringe (10cc) filled with water, to find the 85cc and 100cc levels. Carefully hold the tip of a marker pen against the glass and rotate the bottles slowly to get a line all the way round. The finer and straighter the line, the more accurately you can determine the quantity of fuel delivery. (Yes, I know these look rough....and I hadn't been 'on the bottle'.....)

It will be difficult to hold the bottles in a vertical position during the actual test, so when conducting the test view the bottles from the side, watch a point on the 100cc lines between the front and rear of each bottle. When the (highest) fuel level reaches that point, stop, level the bottles, and check the levels. If necessary continue enough to reach the line.



Fix the clips on the wood batten at approximately the same distance apart as the injectors are in the engine.

Ensure that the bottles are dry (leave them on a radiator for a few hours).





**Make up a link wires with an On/Off switch, and spade terminals as shown.**

**The cable used here is 5 amp, 2 suitable lengths to reach from the fuse box to the front of the car.**

**Mark the switch clearly to show On and Off positions.**

**Ideally, an 8 amp fuse should be placed in this link.**

**This will enable you to switch the fuel pump on and off remotely from the engine bay, without the ignition switched on.**



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### **The Basic injector test procedure**

**Remove the throttle cable by pulling the metal clip towards the bulkhead and lifting the cable ball and socket connector from the throttle linkage.**



**Remove pipes and hoses from engine to allow easy access to the injectors.**

**The time taken to do this will prove invaluable when trying to remove the injectors, and make the whole procedure a lot less frustrating.**



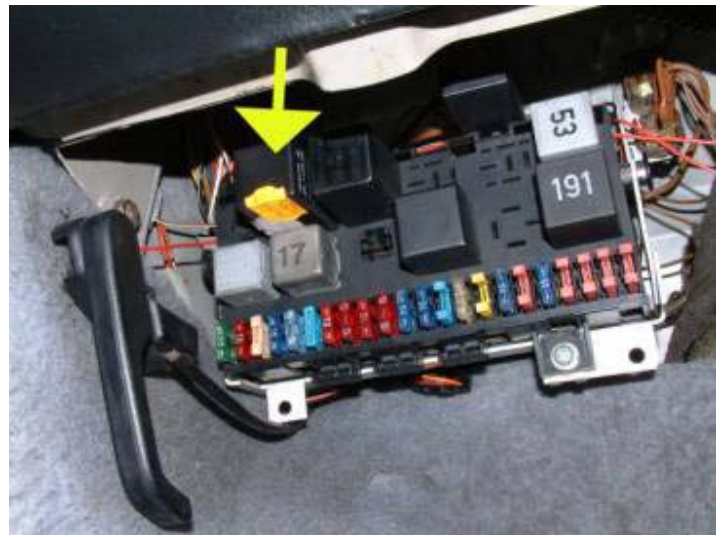
**It would also be prudent to disconnect the electrical connection to the 5<sup>th</sup> injector (behind the left hand arrow in the pic above) and remove the injector itself. This would prevent the injector spraying fuel into the manifold and flooding the cylinders if the 'system' thinks it's cold enough to use the 5<sup>th</sup> injector, or the 5<sup>th</sup> injector is faulty and locked open.**

**Spray the injector seals with WD40 to lubricate the seals and mounts.**

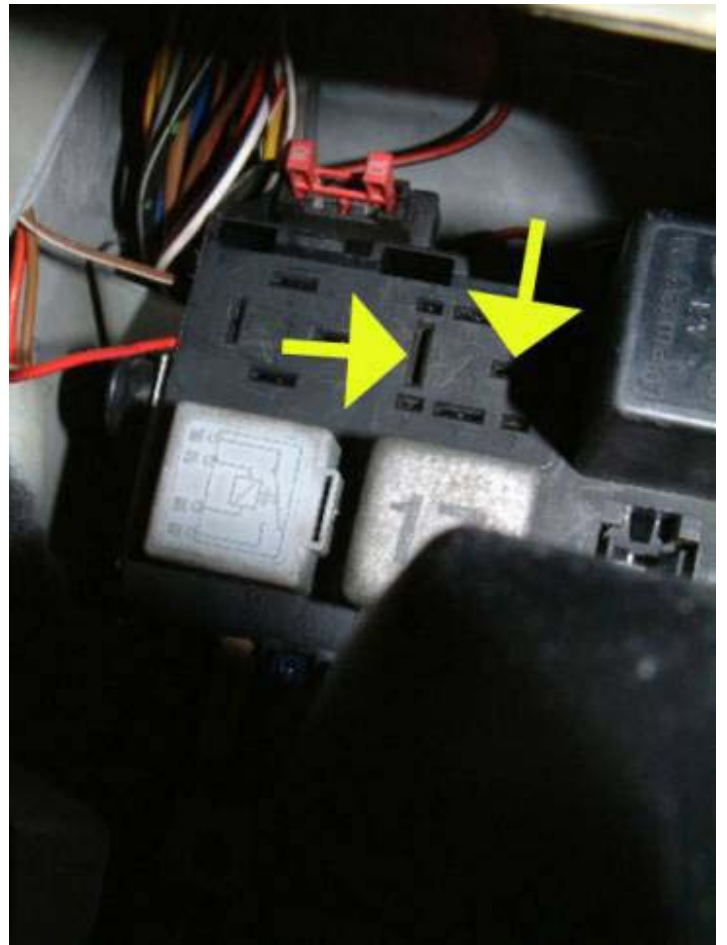
**Failure to do this may result in the removal being very difficult and may leave the seal in the mount, particularly if the injectors have not been removed for a long time, and the seals were not lubricated with grease before being inserted.**



Remove the main fuel pump relay (marked here with the yellow label and arrow).



Identify the 2 large fuel pump relay terminal sockets on the relay board.





**MAKE SURE** that the switch is in the 'OFF' position.

**BE CAREFUL TO AVOID SHORTING THE WIRES AGAINST EACH OTHER OR TO EARTH.**

Insert spade terminals into the large terminal sockets one at a time.

Place the switch in a safe and secure position at the front of the car, **AWAY FROM THE INJECTORS** to avoid a spark causing an explosion, and where it can be easily reached. Use electrical tape to hold it onto the battery handle.



**Remove the induction pipe from the metering head and throttle body.**



Fold 1/3<sup>rd</sup> of a length of tape back on itself (to avoid it sticking to everything in sight), and being **CAREFUL NOT TO PUSH THE PLATE DOWNWARDS**, stick the remaining sticky part of the tape onto the airflow sensor plate.



Place a rag/cloth on the rocker cover.

Using a pair of long-nosed pliers as shown, and using the rocker cover as the pivot, gently ease the injectors (with the pipes) out in the direction indicated by the arrow.



As you pull the injector watch the top of the injector where it goes into the manifold, you should see the seal come out **WITH** the injector. If the seal remains in the manifold either:

... carry on pulling the injector, but be very careful and stop if you feel any further resistance. This may mean that your injector has a 'hat' on the nozzle end, and if it is pulled off it can be a real bitch to extract – I've been there and done it! It won't fall into the manifold, but it must be removed.

Or.....try to free it with a very small screwdriver or similar sharp instrument. Don't worry about damage to the seal as you should replace all of them with new ones.

Insert the injectors into the bottles as shown.

Ensure that everything will stay securely in position. Use removable cable ties if necessary.

The injectors should sit naturally as shown, allowing you to see the spray pattern clearly.

The bottles shown here do not show the volume marks described earlier.



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**DONOT** switch the ignition on.

Switch the fuel pump on using the shorting link and switch.

The fuel pump may prime, the injectors may chatter and a small amount of fuel may flow, but should then stop.





**Gently lift the airflow sensor plate.**

**There should be no fuel flow to the injectors until the plate is lifted.**

**The amount of lift regulates the fuel flow.**

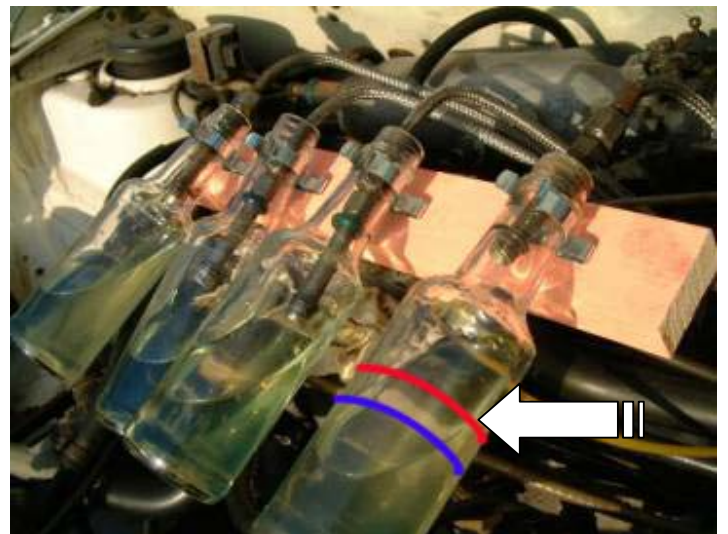


**Watch the spray pattern of each injector, lifting and lowering the sensor plate to vary the fuel flow rate.**

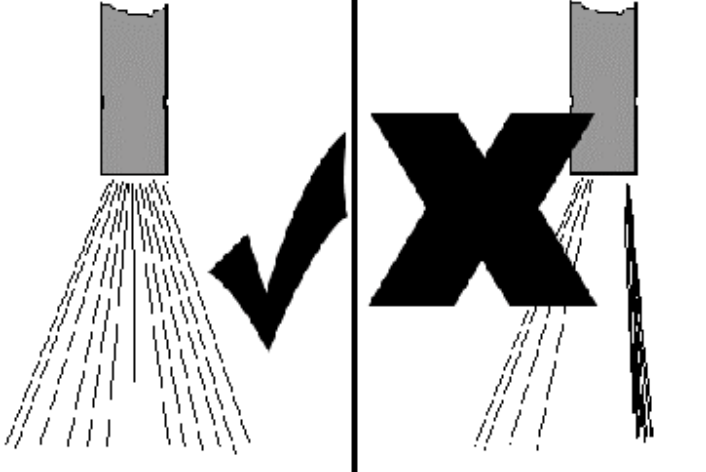

**You should have a fine conical shaped spray with no dribbling or jetting (see the illustration below).**

**When the bottles are about  $\frac{3}{4}$  full, or if you marked them as detailed earlier, when the fullest reaches the 100cc mark (at the point indicated by the arrow),**  
**- lower the plate and turn the switch off, but keep looking at the injectors for any sign of leaks or dribbling from the nozzles.**

**The injectors should not leak after the fuel has been shut off.**





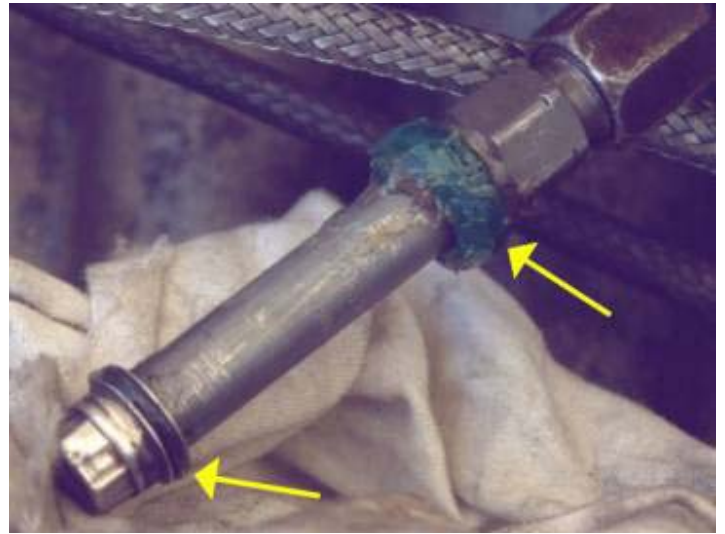
<p>You should have a fine conical shaped spray (left) with no dribbling or jetting (right).</p>	
<p>If any injector shows a low output (No's 2 and 3 are low in the photo) swap the injectors on the pipes and retest.</p> <p>Here we would swap over No's 1 with 2, and 3 with 4.</p> <p>If the same injector on a different pipe still gives a lower output - the injector is at fault</p> <p>If the same pipe, but a different injector gives a lower output - the metering head / pipe has a fault</p> <p>In the perfect world, each bottle should be filled to the 100cc mark (red), but none should be less than 85cc (blue). The marks shown are for demonstration only.</p> <p>I usually put the fuel back in the tank.</p>	
<p><b>Removing injectors from pipes</b>  <b>WARNING: Fuel may spray from the joint due to the residual pressure in the system.</b>  <b>Spanners: 12mm and 14mm</b></p>	<p>Awaiting image</p>
<p><b>Replacing injectors on pipes</b>  <b>Ensure the threads are clean and undamaged.</b>  <b>Torque - 25Nm (18 lbf ft)</b></p>	<p>Awaiting image</p>

When all testing has been completed remove the switched shorting link from the fuse/relay board, and replace the main fuel pump relay.

Replace all the seals with new ones (available cheaply from VAG).

Grease the injector seal(s) with good quality 'high melting point' grease. This will make any later removal easier.

Some injectors do not have the little 'hat' on the nozzle end, and some may have a circlip below the large seal.



**TIP:** I usually pull the injectors every 6 months to check the condition of the seals, and re-grease them to keep a good seal and make later removal easier.

**Replace the injectors, pushing them gently in the direction shown. They should just 'pop' in with little effort.**



**I find it advantageous at this point to clean around the top of the manifold and the rocker cover, checking for any oil leaks at the rear of the cover, checking the nuts and the earth strap attached at the gearbox end of the cover (many weird instrument electrical faults can appear if this earth strap is not connected properly).**

**Replace all pipe work and the throttle cable (and the 5<sup>th</sup> injector if you removed it earlier).**

**Test-drive the car. Yes, I know it's obvious but delay that cuppa for a few more minutes.**