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TECHNICAL REPORT

Replace camshaft and lifters in
injector pump engines



PURPOSE

Instruction for the correct **assembly of camshaft and hydraulic lifters** injector-pump TDI engines of the VAG Group.

INTRODUCTION

An injector pump, as its name says, is an **injection pump and injector**, equipped with a solenoid, grouped into a single component.

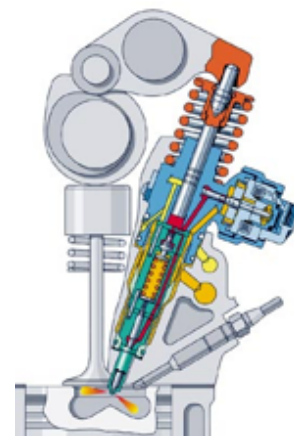
The injector-pump system is a unit that connects the pressure generator with the fuel injection inside the combustion chamber; different to the common rail, where the pressure is in the pipe, and then it is only the injector that decides when and how to let the fuel in.

Each cylinder of the engine has its own injector-pump which, due to the high injection pressure necessary (2000 bar) is mechanically actuated by an injection camshaft for each one of the pump-injector and cylinder.

An injector-pump system is made of several components and all of them **must work synchronized for a good performance** of the engine.

Among these elements, **camshaft and hydraulic lifters** must be pointed out; the camshaft is in charge of the opening and closing of valves, as well as other functions, such as actuating the fuel pump, vacuum pump, injectors, etc.

Hydraulic lifters are in charge of compensating tolerances, wear, clearance, expansions and contractions of materials between the camshaft and valves.



These elements are highly stressed during performance; for this reason it is necessary that all the pieces related with the timing **are in perfect conditions**, since any wear, a piece out of tolerance, wrong adjustment, have critical consequences because they multiply their effects both in the camshaft as in lifters.

SHOWING

1 | Early wear of components

An **early wear** of two metal pieces in continuous friction are usually related with lubrication problems, as it may be a low oil level, a **bad performance of the oil pump and a bad lubrication** in the areas in contact; but there are also other reasons that may accelerate the wear of the pieces, such as:

- Incompatible materials
- Excessive roughness
- Sudden changes in temperature
- Wrong heat treatment
- Wrong assembly of the timing elements
- Tension caused by bent camshaft or head
- Too much tension in valve springs
- Wrong choice of oil

2 | Recommendations

If we have an engine with **wear problems**, both in the **camshaft as in lifters**, you must take into account the following recommendations when you replace them:

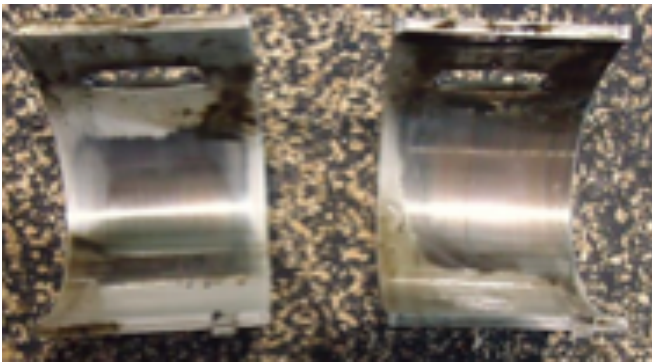
- **Never replace with used lifters** and a new camshaft, or viceversa.
- **Cleaning**: it is very important that the engine and all the parts are clean before installation.

- Make sure all **components are in perfect conditions**, lubrication holes are not obstructed, oil pump is working fine, accurate pressure, clean lubrication circuit, etc.
- Assembly lifters **correctly lubricated** both sides and part in touch with cams and rocker arms.
- **Lubricate supports** of the camshaft and the bearings in touch with the camshaft.
- Assembly bearings **in the same order and orientation as in disassembly** following the manufacturer's specs. If these are not in good conditions, it is advisable to replace them.
- Make sure the **camshaft rotates without any obstacle**; if it is not so, make sure camshaft or head are not bent
- Assembly timing following the manufacturer's specs and using the right tools.
- Use the **right oil** for each engine type.
- If at the time of the repair the oil has metal chips due to wear or abrasion of a galling engine, you must **carefully clean all the oil pipes and replace the oil radiator**.
- Whenever you **replace a camshaft**, it is recommended to **use new lifters** (they cannot be adjusted or repaired individually). After assembling new hydraulic lifters you **must not start the engine in 30 minutes**; in this way, lifters will get rid of the residual oil.

Recommendations for replacing camshafts and lifters in injector-pump TDI engines

To **replace camshafts and hydraulic lifters** in injector-pump engines, it is not only necessary to take into account the above mentioned recommendations; in these cases, it is necessary to **replace** the following:

- 1 Always replace the antifriction caps of the camshaft bearings and see that the fixing lugs fit correctly on the bearings and head.



Wear in antifriction caps where copper coating can be seen.

- Tighten bearings 2 & 4 alternately and crosswise at specified torque **0.8 kpm + 90°**
- Fit bearings 5, 1 & 3 and tighten to the same torque.

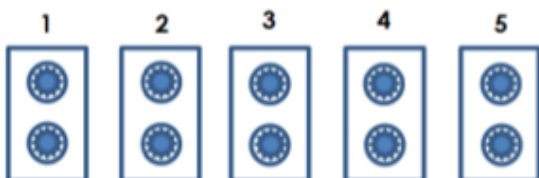
Rocker arm bolts M8 x 90 (8 Bolts)



- Fit rocker arms 1 & 2 firstly tightening internal bolts of each arm and later on the external ones uniformly and crosswise. Specified torque **2 kpm + 90°**

- 2 Replace the bolts of the bearings and the rocker arm shaft following OE specs and repair manual. This type of bolts requires an angular tightening in stages:

Bearing bolts M6 x 54 (10 Bolts)



3 | **Replace the timing kit components** (timing kit and accessories) that are not in good conditions, following the instructions of the repair manual. In these engines and in order to alleviate loads on the toothed belt, there were implanted solutions as antivibrators or a wider belt.



The camshaft wheel has an **antivibrator** that reduces swinging in the toothed belt.

The **toothed belt is 5mm wider** and with this additional surface more intense strengths can be transmitted.

A **hydraulic tensioner maintains a uniform tension** during the different phases of load in the engine

The **crankshaft pulley** or shock absorber pulley, as well as dragging auxiliary elements of the engine, **absorbs vibrations.**

- 4 | Calibration on injector-pumps.** The rocker has an adjusting screw, to adjust the gap between itself and the injector-pump. It is necessary to make the adjustment whenever the injector-pump is disassembled or when any piece taking part in its performing is replaced.

<http://www.ajusa.es/admin/adjunto.aspx?idx=6&nId=311070&ct=application/>

- 5 | Replace oil filter and use the right oil;** in this type of engine it is recommended oil with norm **50501 TDI**. This is very important since the critical wear is not only due to high pressures and loads, but also to the position of the camshaft.

Most of the **regular wear** in an engine is produced **in the first moments after the start**, at this time a film of lube is forming when the oil reaches correctly the most critical parts... it is believed that 70% of the total wear of the life of an engine is produced while it is getting warm until the working temperature; so it is necessary to work with an oil that flows as quickly as possible at the moment of the start, and the reduce to the minimum the performance without oil.