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SIEMENS PIEZO INJECTORS

MANUAL FOR DESASSEMBLY REPAIRING AND REASSEMBLY



PREVIOUS STATEMENT

We wish to offer some short information on the Piezo actuators characteristics, for better understanding the technical choice of their employment for the Common Rail injectors valve action, instead of the traditional solenoids.

PIEZOELECTRICITY

The piezoelectricity is the characteristic by which some crystals, quartz, topaz, and others, like crystal ceramic (piezo ceramic), can be electrically loaded through a mechanical deformation, or alternatively can change shape when submitted to an electrical field action.

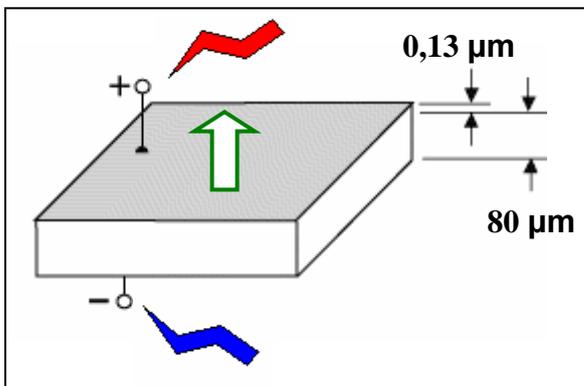
Difference:

Transducers convert a power form into another, for instance: pressure, temperature, etc. into an electrical signal.

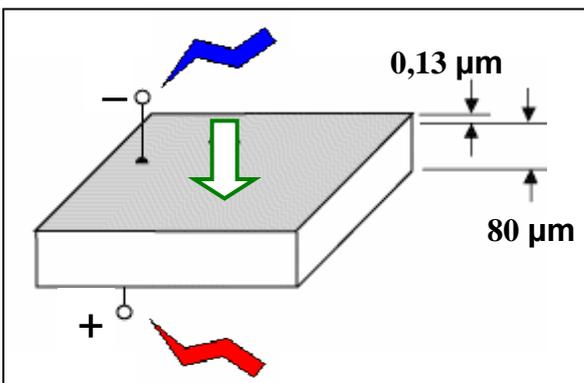
Piezo Actuators convert electrical power into mechanical power (motors) or, alternatively, mechanical power into electrical power (generators).

On Piezo Injectors the actuators are used as 'motors' and modify their shape under the action of an electrical fields.

On Siemens Piezo Injectors the actuator is formed by 80 μm . crystal sheets.



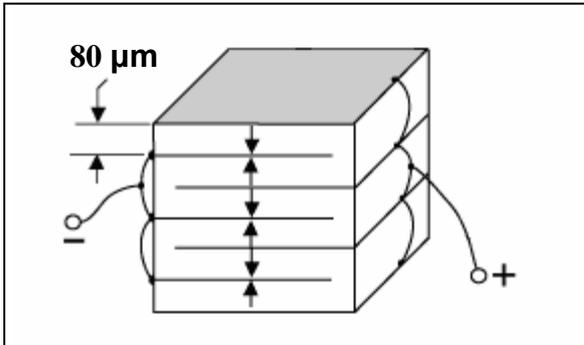
Whenever a piezoceramic sheet receives an electrical signal of the same polarity, as it is in origin, it modifies its thickness expanding 0.13 μm , and remains in this form also after the electrical signal is ceased.



Only when receiving an electrical signal of opposite polarity the same sheet will return to the original shape.

ATTENTION: On a piezo injectors the functions of opening and closing are actuated only through the polarity inversion

DISCONNECTING AN INJECTOR ON A RUNNING ENGINE, THE INJECTOR MAY REMAIN OPEN, CAUSING BIG DAMAGES TO THE ENGINE.



Being the μm 0.13 expansion of a single sheet much too small, it was created a pile of shims, connected each other, forming a monolithic structure.

The piezo Actuator is therefore formed by 350 quartz sheets, each one 80 μm thick, fixed on a pile structure, polarized and connected one by one to its electrical terminal.

The maximum expansion of the Siemens actuator is 40 μm .

The control on the injector is quicker allowing more precision in the fuel injected volume, and a reduction of the smoke emission.

RECONDITIONING

In order to achieve the best result, reducing the working time, it is necessary to take in account the following points:

- A suitable technical and practical knowledge.
- The availability of the necessary equipment, as shown in this manual.
- A methodical procedure in the working and testing system.

In this manual the following procedure has been adopted:

- Tools and equipment for a previous control and disassembly.
- Disassembly
- Check up of the components.
- Tools for components cleaning.
- Reassembly
- Test operations on test bench.

The nomenclature used in this manual, for the description of the various components, is the same one as used in the pictures of the following pages.

NOMENCLATURA INIETTORE 5 WS 40000

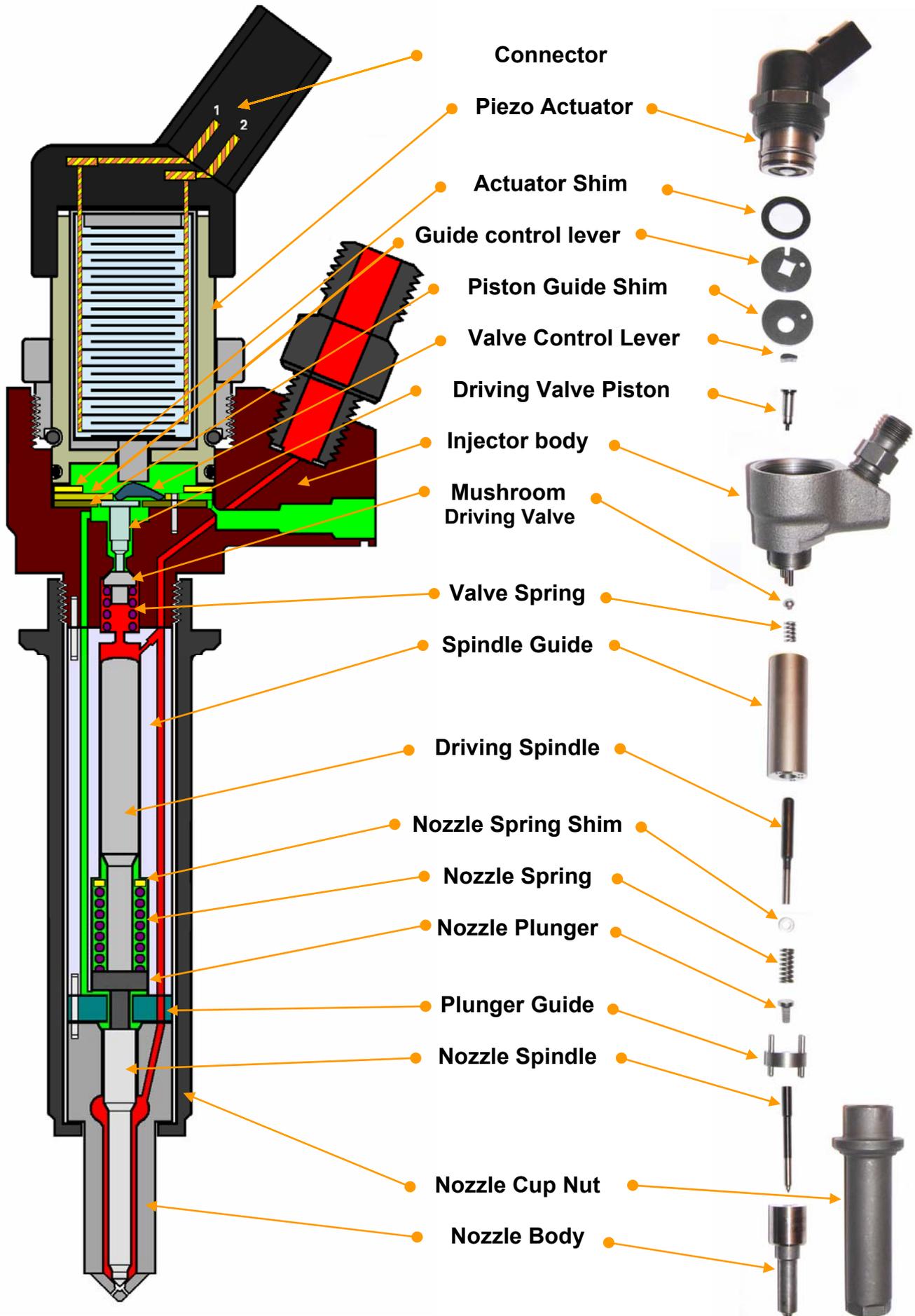


Fig. 1

NOMENCLATURA INIETTORE 5 WS40148 E 40149

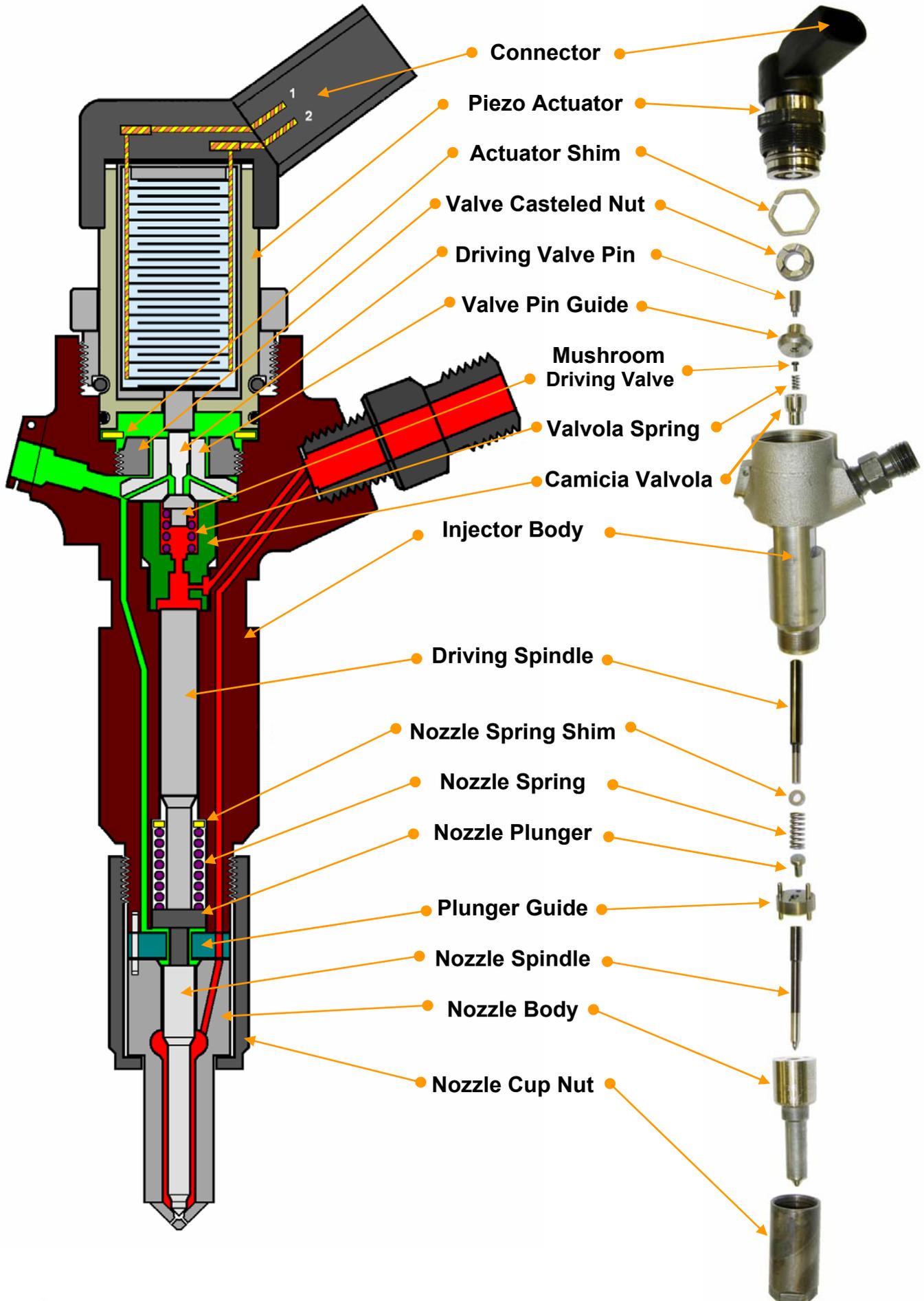


Fig. 2

TOOLS AND EQUIPMENT FOR PREVIOUS CONTROL AND DISASSEMBLY.

- First test the electrical conditions of the injector, in order to decide whether it can be repaired or it should be scrapped.
- Check the electrical insulation of the actuator in order to detect eventual malfunctioning, causing possible damages to the test instruments on test bench operations.
- Use the Ultrasonic cleaning (only on the nozzle side) in order to remove the carbon deposit, making nozzle nut disassembly easier.



DX73780 + DX73781 Instrument and adapter cables to check the piezo actuator electrical characteristics before disassembling

Fig 3



DX73782 Instrument and cables to check the electrical insulation of the piezo injectors before disassembling.

Fig 4



ASW200 Ultrasonic bath for nozzle components cleaning.

Fig 5



DX75165 Press to be used for the correct disassembly and reassembly of the injectors.

Fig 6

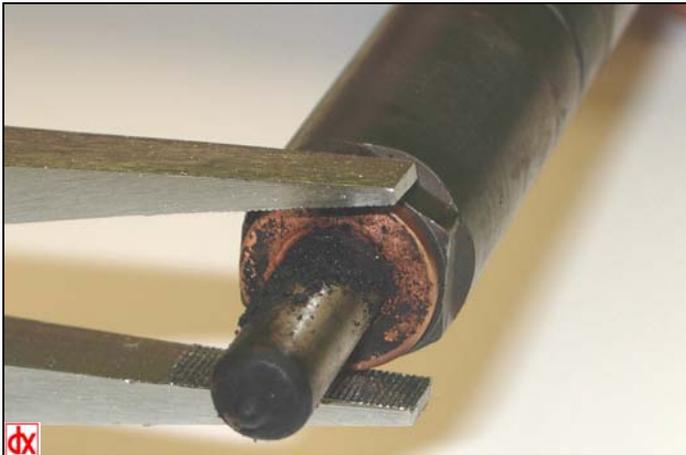


 Fig. 7

Remove the copper heat shield from the nozzle nut.

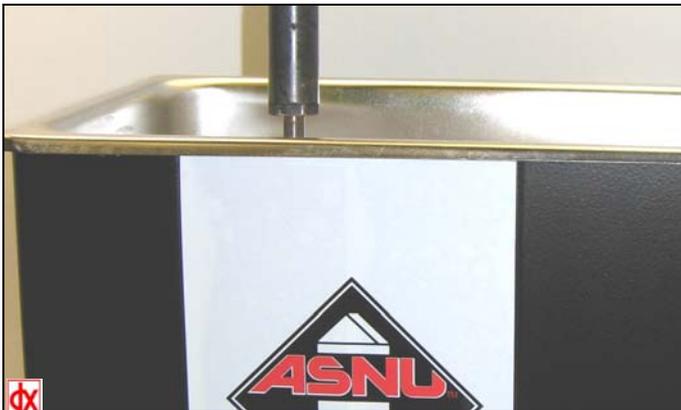


 Fig. 8

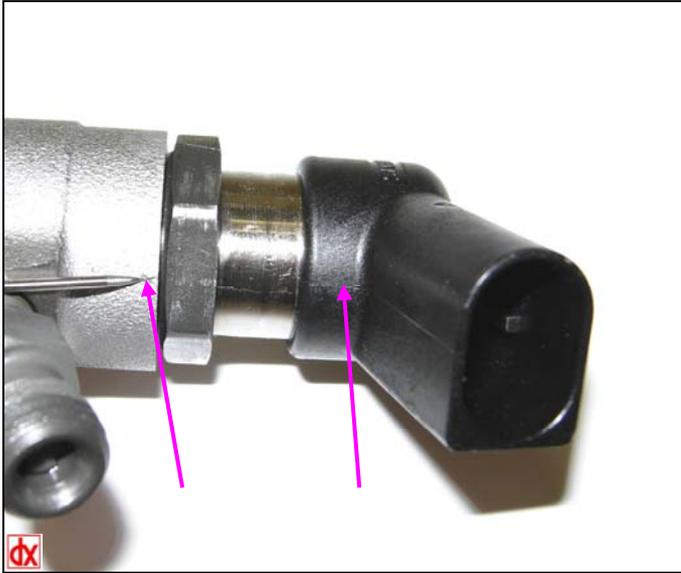
Immerse in the ultrasonic tank only the nozzle and nozzle nut side of the injector and proceed with cleaning operation.



 Fig. 9

The clean condition makes the loosening of the nozzle nut easier, preventing damages to the inside components.

DISASSEMBLY DISESSAMBY OF THE INJECTOR 5W4000



Before loosening the actuator nut, mark a reference sign on the actuator and on the injector body, in order to make the correct reassembly easier.

 Fig. 10



Fit the injector on a vice and loosen the actuator bolt.

 Fig. 11



Unscrew the bolt and remove the actuator.

 Fig. 12



Remove the small valve lever inside the injector.

Fig. 13



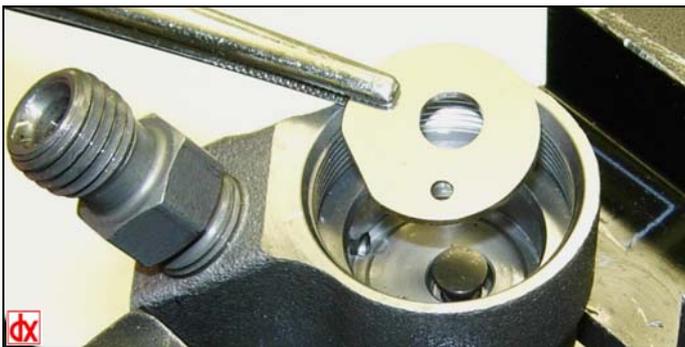
Remove the actuator shim.

Fig. 14



Remove the valve control lever lift shim.

Fig. 15



Remove the driving valve piston lift shim.

Fig. 16



 Fig. 17

Before removing the driving valve piston carry out a previous test for tightness valve check as shown in the following pictures.



 Fig. 18

Fit the injector on a conventional injector tester and increase the pressure up to 200 bar and than stop.
The pressure dropping time from 200 to 100 bar should be not less then 30 sec.

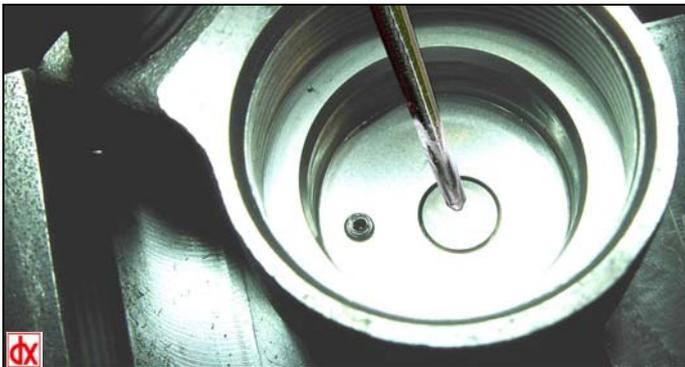


 Fig. 19

After the above test release the pressure pushing on the valve piston.



PERICOLO

Attention: for security reasons, operate as shown in the following picture.



 Fig. 20

Pushing the piston for releasing the pressure cause an injector spray. Therefore revert the nozzle to the vacuum chamber of the injector tester, keeping your fingers away from the spray.



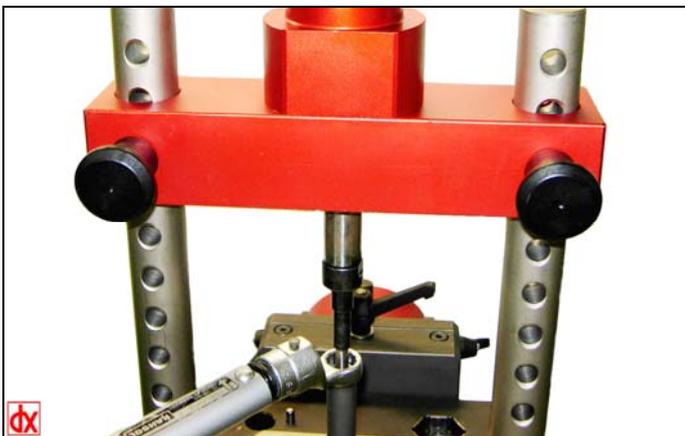
dx
Fig. 21

Remove the valve piston.



dx
Fig. 22

Fit the injector with the plate on the DX 75165 press and tighten the top press bolt at 30 Nm.



dx
Fig. 23

Unscrew the nozzle nut.



Remove the nozzle nut.



Remove the nozzle.



Remove the valve piston guide and piston.

Fig. 26



Remove the driving spindle with its spring and shim.

 Fig. 27



Remove the spindle guide.

 Fig. 28



Remove the mushroom valve and spring.

 Fig. 29



 Fig. 30

Remove the mushroom shape valve.

DISSAMBY OF THE INJECTOR 5W40149

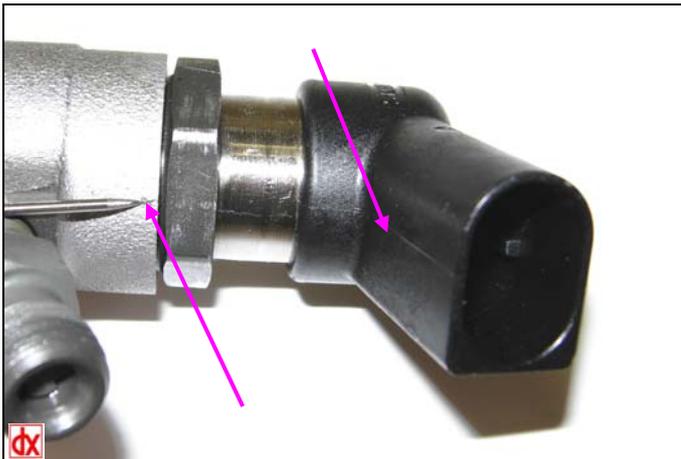


 Fig. 31

Before loosening the actuator nut, mark a reference sign on the actuator and on the injector body, in order to make the correct reassembly easier.



 Fig. 32

Fit the injector on a vice and loosen the actuator bolt.



 Fig. 33

Remove the piezo actuator.



 Fig. 34

Remove the hexagonal actuator shim.

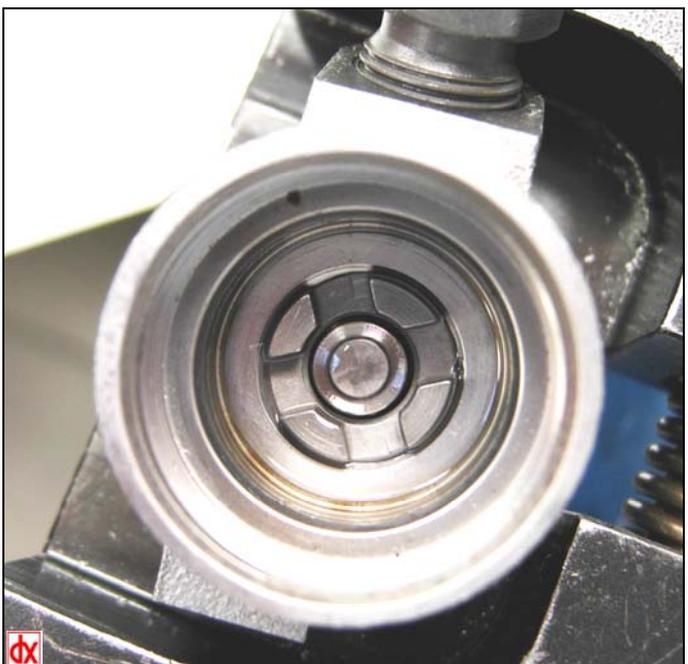


 Fig. 35

Before removing the valve casted nut, check the valve tightness, fitting the injector on a conventional injector tester, as shown in the following pictures.