Control unit for controlling petrol and Diesel injectors (4 injectors)

Owner's Manual

007935095590

Safety Information

Warnings and Notes

The precautionary notes in this publication, indicated by the words WARNING, and NOTE provide information about potential hazards to personnel or equipment.
Ignoring these notes may lead to serious injury to personnel and/or damage to equipment.
These notes appear as follows:

Warning! Indicates that a situation may be hazardous to personnel. Instructions are provided for avoiding personal injury.

NOTE   indicates additional information for operator

Operational Warnings

	Warning! High pressure fluid sprays can cause serious injury or death. Common rail systems operate at extremely high pressures.Never attempt to use test bench without guard doors or protection opened. Always start the system running at a low pressure and visually check for any leaks before setting higher pressures. This particularly applies having just mounted a system, or having just replaced a component. Do not open the guard while the system is running. Wait for the test bench drive to stop and for the rail pressure to decay to a low level before opening the guard. The test equipment is capable of producing high pressure fluid jets or sprays which can cause severe eye injury in the event of a malfunction.The test stand uses calibration fluid which is harmful to the eyes.

      Accidents can occur to unauthorised personnel during testing. Untrained person(s) must not be present in the test area when the equipment is operating. Only qualified personnel are to operate this equipment.

Gloves must be worn when handling parts after testing which may be hot.

Burns will occur to the hands if certain parts of the test stand or equipment under test are touched. Keep hands away from calibration fluid and injector or high-pressure pipes after periods of extended running.

Severe injury can be caused by slipping on spilt oils or fluids. All spillage of fluids in the test area must be dealt with immediately.

Smoking in the vicinity of the equipment is strictly forbidden. Potentially flammable vapours are present in the test stand and ignition is possible although unlikely.

Ensure that the servicing requirements for test bench are observed and adhered to.. Operate and service this equipment only if competent to do so. Carry out regular inspections to make sure all high pressure connections are tight and safe.

Fluid sprays, especially from leaking high pressure pipes and seals, will cause high pressure injection through the skin which can result in fatal injury.

• INTRODUCTION:

The DGIC is a multifunction Instrument tool that could be operated for multy pourpose targets. From the optionals installed depending many various possible working operation.

SPECIFICATION

Injector Control 4 channel injector drive circuit, suitable for drive current to Bosch, Delphi & Denso solenoid injectors and Continental piezo injectors.

Injector Measurements   4 channel solenoid resistance and coil impedance measurement.
Single channel response time measurement.

Electrical Power Requirement 110/ 220 VAC 40- 60 Hz fused at 3 Amps

DEFINITION OF TERMS AND ABBREVIATIONS

MCBR – 4   Multipurpouse EUI / EUP – CR system all Makes
eRLC   injector coil electrical test
NOP   nozzle opening pressure
SPR   Spray test
LKT   Backleak test
iVM   Injector volume measurement
RSP   Injector response time
IRVL   Injector internal ball valve maximum height mesurement
CR   Common rail
FCV   Flow control valve
I/P   Input
O/P   Output
PCV   Pressure control valve
VCV   Volume control valve
RS232   Serial communications

Common rail Injector drive signal features for solenoid coil valve

SOLENOID VALVES

These are electromagnetic coil valves; a schematic of the drive signal (showing current against time) is given in figure. There is a higher "pull-in current" (I_p) to initially open the valve, followed by a lower "hold current" (I_h) to keep the valve open. The overall pulse width (T) is the combined width of the pull-in and hold phases. There is a maximum limit on the pull-in current to protect the solenoid.

Injectors with solenoid valves are currently manufactured by Bosch, Delphi, and Denso. Each of these manufacturers uses a different specification for operating voltage and current level
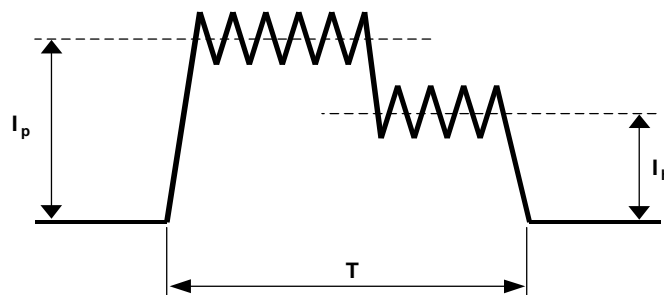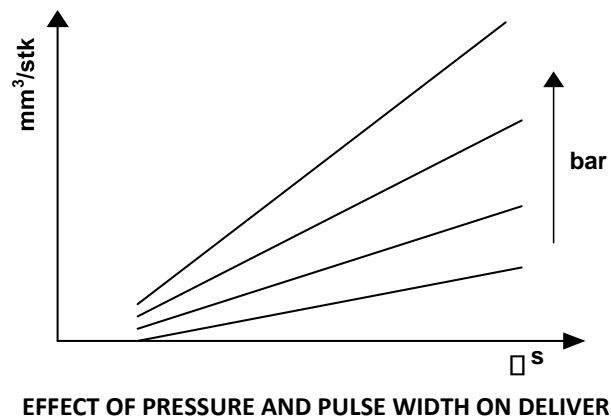

EFFECT OF PRESSURE AND PULSE WIDTH ON DELIVER

FIGURE 3.2 SOLENOID INJECTOR DRIVE SIGNAL

PIEZO VALVES

These use the inherent properties of piezo crystals to activate the valve. There is a positive current pulse (I) to switch the valve on, and a negative current pulse to switch the valve off. The overall pulse width (T) is the time between the positive and negative current pulses.
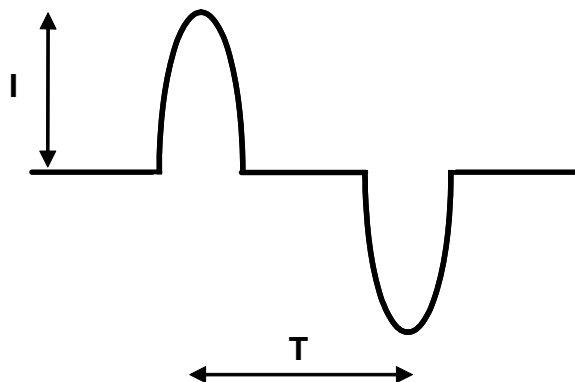
Piezo Injector Drive Signal

Siemens were the first manufacturer to introduce piezo injectors, the main advantage over solenoid valves being that piezo valves have a much faster response time.
Actually piezo CR injector operating valve are adopted from the most important wordwide injector manufacurers

- ## WARNING:

It is client responsability for test bench used in congjuntion with DGIC simulator to be kept perfectly working and well regurarly maintened.
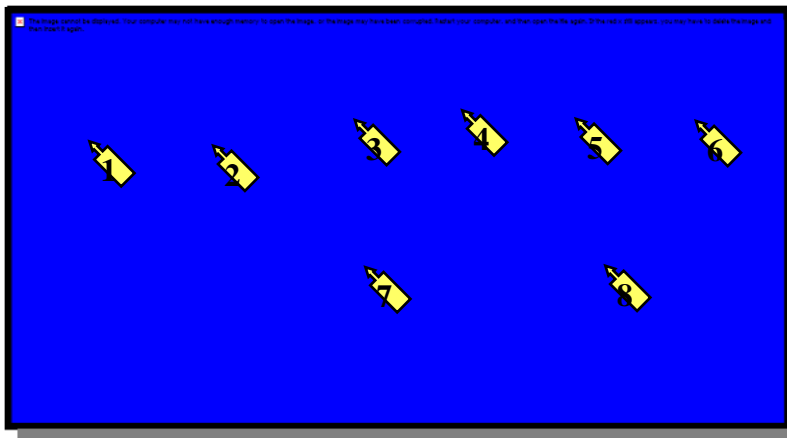SPRY PROTECTION SAFETY FIXTURES PANELS SHOULD BE IN OPERATION DURING ALL DGIC TEST.

FRONT PANEL:

1 = „START" green arrow;
2 = „STOP" red button;
3 = „HP" On/Off inlet
 pressure;
4 = „F_1";
5 = Move to right (Dx);

6 = „F2";
7 = Move to up;
8 = „F" mulifunction
 button;;
9 = move to down;
10 = „DB" Data Base;

11 = „Freccia a Sinistra
(Sx); 12 = „F3"; 13 = ?
14 = ?
15 = ?

- ## BACK PANEL:

1 = Power On/Off;
2 = Inlet soket 220VAC.
3 = Injectors cable;
4 = Sensor Pression cable;
5 = Pressure regulator valve cable;
6 = 12VDC output;
7 = Soket for RSP sensor:
8 = Soket proximity sensor (Cam-Box);

- ## RS-232 soket:

1 = The „RS-232"is positioned on the right back corner of simulator DGIC.
 It is used to connect the DGIC simulator to   a computer, allowing updating of new Sw version or operating sistem. Updating Sw. could be:
a)New basic Sw version .
b)New languages spoken from DGIC.

AIR VENTS AND COOLING FAN:

ATTENTION:

 DGIC IS EQUIPPED WITH A FAN FOR COOLING AND SLOTS IN THE CARPENTRY TO ALLOW AIR CIRCULATION INSIDE .
BE CAREFULL NOT TO OBSTRUT AIR SLOTS OR FAN COOLING PATS.
TACHE CARE TO MAKE ROUTINE MAINTENANCE TO AVOID / ELIMINATE DUST ENTERING SIMULATOR
 OR DIRTY   ACCUMULATING INSIDE OVER MAIN PCB.

- **POLARITY**

- Some common rail injectors, whether coil (Coil) or piezoelectric (piezo) have a specific polarity.
- Bosch common rail injectors, have to connect positive (+) on PIN_1;
- VDO (Continental) CR injector, have positive (+) located on PIN_2;
- If wiring connector is equipped with specifical manufacturer connector, for example Delphicoil), the connection is "forced" and there is no possibility of error.

- **THE "DB" DATA BASE:**

- Button "DB" provides access to Data Base.
- On this page is possible to can make choice of:
- ◦ "Brand"Manufacturer of Common Rail Injector (Eg: Bosch, Delphi, ...);
- ◦ Type, for Bosch, it can be specified ifCRI or CRIN;
- ◦ Model, or the code (Eg: 0445110xxx or 0445120xxx);
  Chosing – ALL- DGIC show a complete list of Common rail injectors content of data base.

- **WARNINGS:**
-
- ◦ Before, during and after the use of DGIC be sure to work always in respect of safety rules
- ◦ Do not use the DGIC for uses other than for which it was designed;
- ◦Be instructed about use of safety best practise before start working on the DGIC for any doubt, contact your dealer;

- **OTHER:**

.   SWITCHING ON SIMULATOR:
     Switch the On / Off button from off / to On position.

- HOME
 When on this page of the DGIC show "HOME".

Fig. 1 home page

On this page you can view software version.
Symbol of "key", shows that the key can provide access to "SETTINGS" (customize DGIC standard settings).

Press START (green arrow) to enter the test menu;

- Use the arrows "UP-DOWN" to select the test to be performed;
- Press START (green arrow) to get access to the test.

Fig 2   Test selecting page
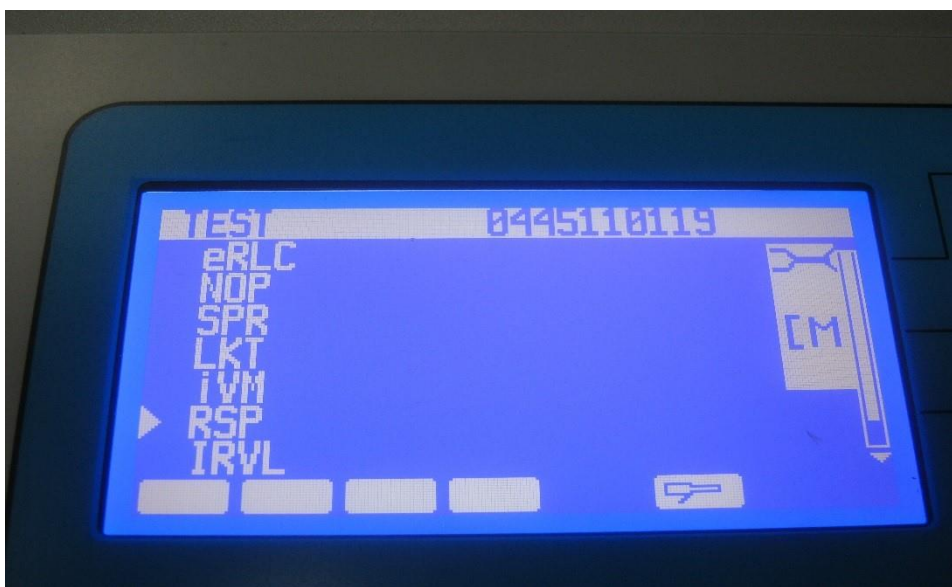
MENU 'TEST:

"ERLC"   Electrical coil test coils
                This test can be used to check coil funcjonality of injectors, both on test bench
                or workshop.

"NOP"   Injector Nozzle Opening Pression

                This test can be run both using a Test master manual or automatic, or also
                directly on   test bench, opening one at a time caps collection liquid
                discharge of nozzles.

                WARNING

                During this test there is no protection to operator from injector
                spray , remember that injector system under test is in living
                condition without protection from spray caps inserted.!!!!

        Nozzle spray entering skin is very dangerous!!

DO NOT ATTEMPT TO TOUCH NOZZLE TIPS !!

"SPR" Visual Injector Spray test report

This test is to be performed on test bench, with nozzle protection caps inserted and securely
fastened.
The test is performed   at four different parameters setting,
To move between the four test spray, navigate using arrows "R." (Right) - "L." (Left).
To change parameters of "STRK" and "P" within each test (SPR.1 - SPR.2 - SPR.3 - SPR.4) press
the F"button and then move with the arrow keys to select and customize parameters. To exit
parameter setting press "F".

"LKT" Leaking Test

This test is to be performed on the test bench. It can be performed in two ways:
    a) With collecting spray cups inserted on spray nozzle anf firmly fixed in position:
    b) With collecting spray cups not inserted on spray nozzle :

    a) With collecting spray cups inserted on spray nozzle anf firmly fixed in position:

During execution of test, check that the piping line or respective reading glass on test bench are full of liquid,during this test injectors are not electrically energised, so there should   not be any liquid collecting inside respective reading glass.
Return line instead, should be in the range of tollerance as stated from test plan.

    b) With collecting spray cups not inserted on spray nozzle :

if this test is executed without spray caps protection, be absolutely sure to adopt all safety procedures for operator safety.

Pay attention, during this test, in case of failure of one or more injectors, there is a risk of   operator safety,due to unespected spray from injectors.

SAFETY WARNING

DO NON TOUCH NOZZLES WITHOUT SPRAY PROTECTION CAPS INSERTED ON INJECTORS CUPS.!!!

"IVM" Injection Volume Measurment

This test is to be performed on the test bench, with cups for collecting liquid flow inserted and fastened securely in position on nozzles sprayer.
The test is to perform flow tests at four different pressure setting.
To move between different flow tests, navigate using the arrows "R." (Right) - "L." (Left).

For parameters changing of "STRK" and "P" within each test (VTP.1 - VTP.2 - VTP.3 - VTP.4) press "F" key and then move with the arrow keys to select and customize parameters.

 Note:
Pressure target requested from test plan is automatically adjusted by the DGIC until pressure goalis obtained .

Until actual pressure (value measured by the pressure sensor) has not reached the target value the DGIC will make a warning sound (beep-beep-beep) indicating the presence of an anomaly. The DGIC stops "beeping" at the moment the actual pressure reaches target pressure as requested from test plan tollerances

.
PAY ATTENTION:

- It seems non sense to say, but to got pressure, test bench should be running and Common Rail Pump should deliver test oil pressure to injectors rail.

- Do not forget:

- Test bench not running, no common rail pump working well, no pressure!
- During IVM (inlet metering valve)test, check that the values of flow (D) and return line (R), are in tolerance, as requested from test plan.

"RSP" Response time test

This test is to be performed on the test bench, with special caps equipped with RSP sensor (OPTIONAL) inserted and securely fastened in position on nozzle cup prayer.

Aim of this test, is to show evidence of perfect dinamic functionality of injector as a unit.

Test bench running, common rail pump working well, DGIC will trig injector coil, take memory of starting time, count number of pulses.

Common rail injector will spray; again DGIC simulator will count number of injector sprays, and delay time from trigger pulse.

Any difference between number of trigger pulses and spray events missing will be indicative of an injector fault.

Any difference between delay time stated in test plan and actual delay time obtained during test will also be sintomatic of an injector fault.

Note:

Response time ist to be considered one of the most important test to reveal injector faults at once, for its capacity to analize common rail injector as a dynamic unit during real time functionality !!!!!!

◦ **Note:**

RSP sensor assy is optional, if not in the order list of accessory, RSP test can not be run!!!!!!!

"IRVL"   Electrical dinamic check of coil valve ball lifting internal functionality

This test is NOT performed on the bench. It can be run in two ways:

1) AAZ006-KIT content:

Comparator base with granite countertops and digital gauge. (resolution = 0.001 mm). Taking care to place the injector in the correct position.

2)AZ0352-CR content:

Rotary press used for complete disassembly and assembly of common rail injectors during repairing process. Complete with digital micron gauge (0,001 mm). Taking care to place the injector in the correct position.

Note: in both cases, procedure to test IRLV is the same.

Difference betwueen the use of kit 1) AAZ006 and kit 2) AZ 0352 _ CR kit :

1) AAZ006, is a kit to be used for testing the core of lifting ball of an injector in dinamic test only.

2) AZ 0352-CR, is a complete kit, a more complete specialized tool that permits the complete process of common rail injector cheking and repair plus IRVL check value.

In both cases the tools AAZ006-KIT and AZ0352-CR are optional tools related to DGIC, so execution of test IRVL is closely linked to the option acquired.

IRVL test, is iniziated applying an electrical signal of specific value to injector coil to make the internal ball forced to lift from it'seat allowing to take measurement in the order of 0,001 millimiters of complete value of internal ball travel.

Every pulse applied to coil, will cause the internal injector ball move up from lt's seat , this movementis is detected from the millesimal digital gauge and saved until next test for operator to check.

Pressing of F" key, will allow to enter IRLV test page , in this page it's possible for the operator to change electrical signals setting for the execution of IRVL test" .
Electrical parameters setting values changes are obtained, using arrows key, chosing parameters to be modified and changing values.

OPERATING

1. From Home menu, select start to begin test
2. DGIC screen will ask operator   to select a new code / new brand injector.
3. Select start to continue or stop to jump to next step.

Figure 3   Injector selection

.

If START is selected(green button) the DGIC sw will scift to data base (DB) screen.

From (DB) screen it could be selected injector brand (bosch – delphi – denso- continental),type of injector (coil or piezo)and injector code for injector under test . (see previosly description for "db" (data base) button..
If stop is selected, red button, the DGiC sw will jump to test selection screen first step (erlc).
Note: after sselecting the desired injector to test from the data base screen (db), the DGiC will show the screen before "erlc".
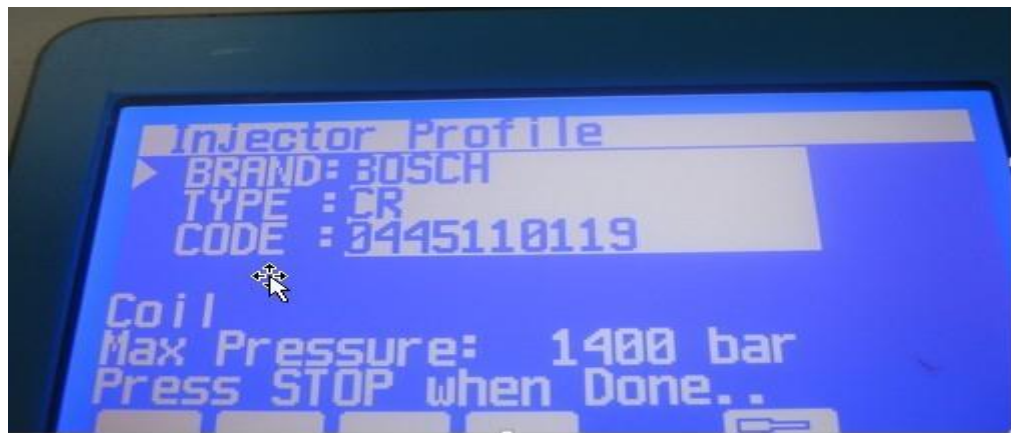
Fig. 4   complete injector selection

> • On this page, DGIC will ask for checking common rail connection ,than for air purge of idraulic lines to stabilize test oil temperature.
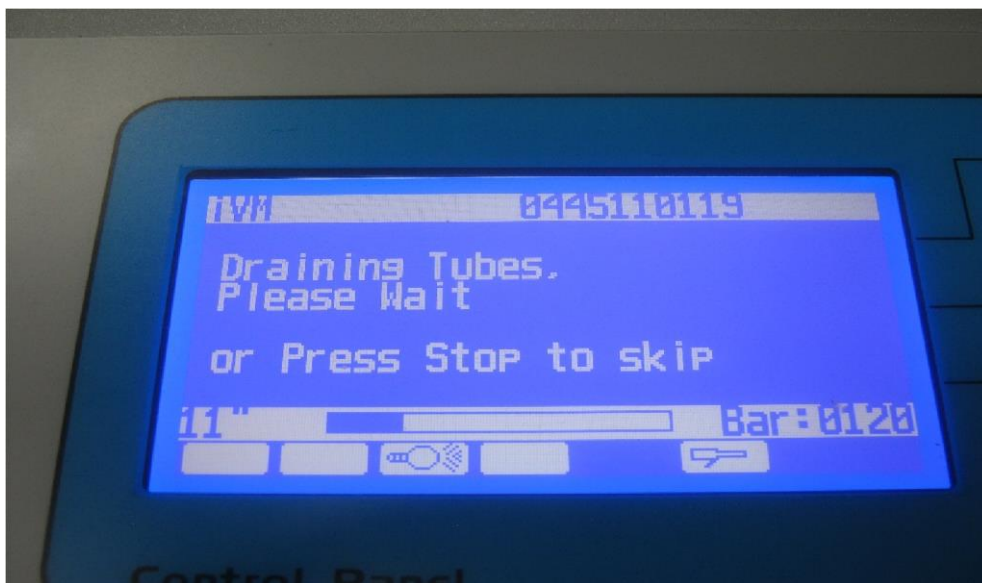

Fig. 5   Draining lines and stabilization

PUSCH (START(TO CONTINUE OR (STOP) TO JUMP..
IF (START) IS SELECTED THE DGIC WILL SHOW THE HELP SCREEN.
THE OPERATOR WILL BE ASKED TO CONNECT THE HIGH PRESSURE PIPES FROM RAIL TO INLET PORT OF INJECTOR UNDER TEST.
CHECK AND CONNECT THE ELECTRICAL WIRING FROM DGIC CABLE TO INJECTOR CONNECTOR CHECKING FOR CORRECT POLARITY.(REFER TO (POLARITY) PARAGRAPH.
CONNECT NOZZLE SPRAY LINE (D) FROM NOZZLE TO TEST BENCH RESPECTIVE READING GLASS.

CONNECT RETURN LINES (R FROM INJECTOR TO RESPECTIVE BACKLEAK READING TEST BENCH GLASS.

WHEN ANYTHING IS READY AND CHECKED SELECT (START)

THE SCREEN WILL SHOW:

- ◦   NAME OF TEST;
- ◦   CODE FOR SELECTED INJECTOR;
- ◦   OHM EFFECTIVE VALUE OF INJECTOR COIL UNDER TEST RELEAVED FROM DGIC, PLUS RANGE OF TEST PLAN TOLLERANCE;
- ◦ MICROHENRY (UH)VALUE OF INJECTOR COIL UNDER TEST, PLUS RANGE OF TOLLERANCE RELEAVED FROM TEST PLAN.

- ◦   THE OPERATOR INSTRUCTION (PUSCH START TO CONTINUE):

AFTER SELECTING (START) THE DGIC WILL REPORT OHMS AND MICROHENRY VALUES OF INJECTOR UNDER TEST .

VERIFY COIL ELECTRICAL VALUES FOR TEST PLAN TOLLERANCE..

TO CHECK INJECTOR NUMBER 2- 3 – 4 PUSCH RIGHT NARROW TO LET DGIC CHECH FOR COIL ELECTRICAL VALUES FOR ALL INJECTOR UNDER TEST.

COMPARE EFFECTIVE VALUES FROM INJECTOR TO ESTABILISCH IF IN THE RANGE REQUIRED FROM TEST.
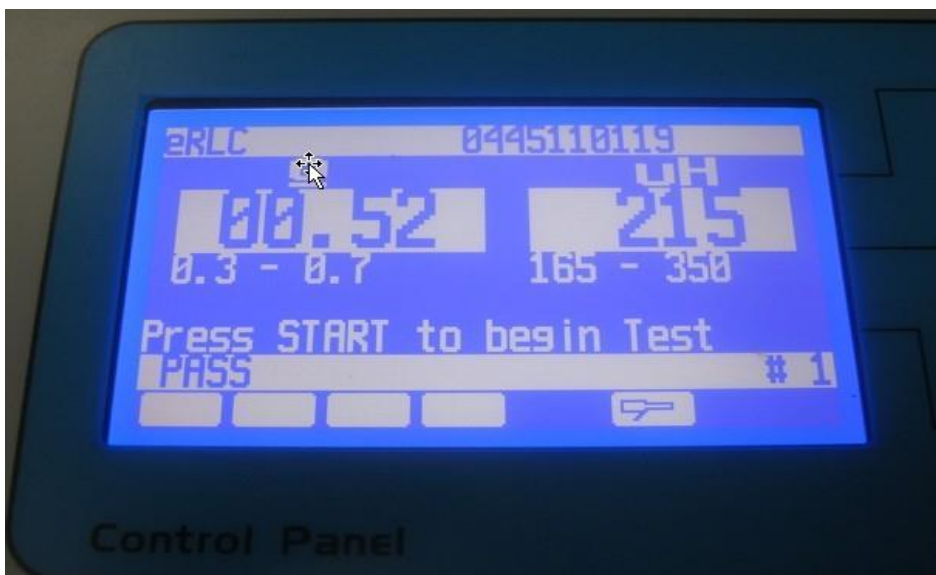

Fig. 6   ERL value for injector selected coil

- When all test are completed, select (STOP) to return from (e RLC) test screen menu to(test menu) screen.
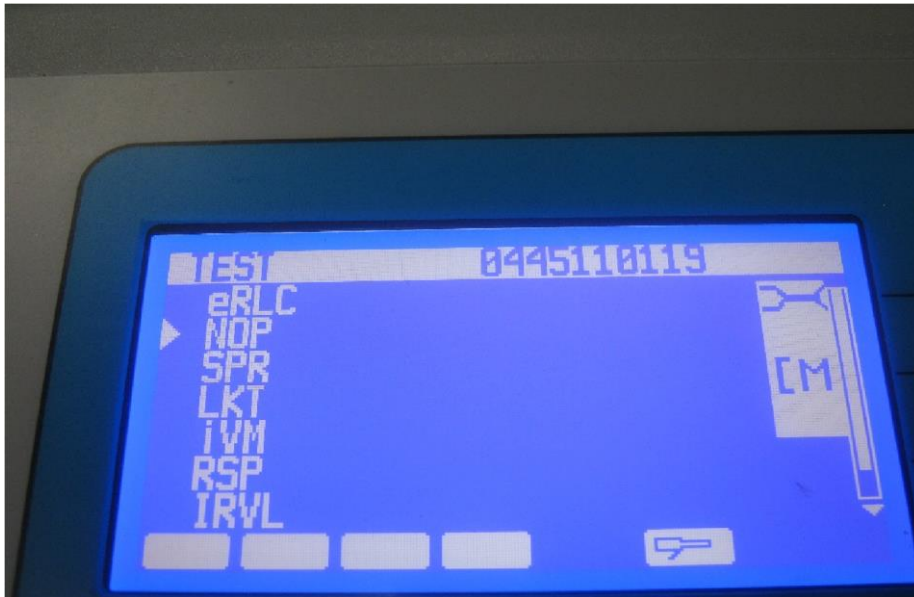
1. **"NOP"**

Fig. 7   Test selection page

After selecting test to be executed, pusch (START).

- DGIC display will show the (HELP) instruction:
-

This test can be run in two way:
1. With the option RSP sensor kit inserted on nozzle spray tip of injectors.
2. Without any spray tip cap inserted on spray nozzles.

Using RSP piezo sensor will make this test very easy to obtain, piezo sensor inserted on nozzle spray tip, will sense any pressure variation caused from nozzle spray event so that NOP value for all injector under test could be assessed very precisily, without any danger for operator.

In case RSP piezo sensor kit is not available, injectors will be operated without spray cup protection inserted on nozzle tip,operator should take evidence of pressure that injector start to spray.

WARNING

DO NOT TOUCH NOZZLE SPRAY TIP FOR ANY REASON DURING THIS TEST, FAULTY INJECTOR COULD START SPRAY AT ONCE , AT ANY PRESSURE .!!!!|

NEVER OPERATE INJECTOR AT THIS STAGE WITHOUT AT LEAST TEST BENCH PROTECTION PLEXIGAS POSITIONED IN FRONT OF INJECTORS.!!!!

NOP Test

If ready pusch (START)

DGIC will instruct to:
Adjust rail pressure ,increasing from zero bar to NOP opening pressure.
Generally speaking this pressure value should be in the range as for displayed from test plan.
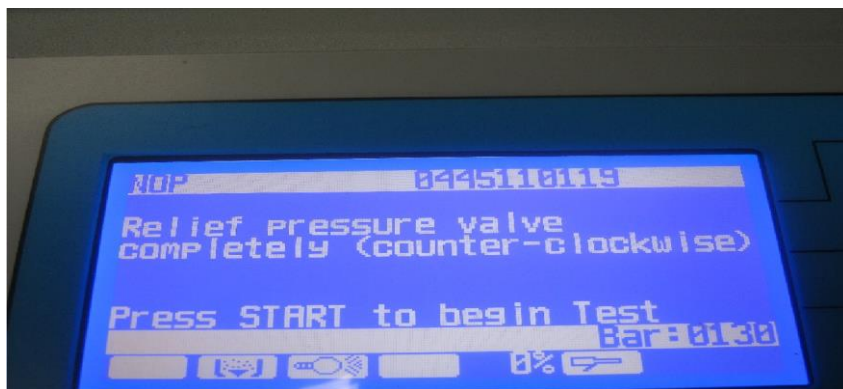

Fig. 8   Adjusting pressure for NOP test

.

3. "slowly increase value of rail pressure to chech NOP (nozzle opening pressure) of injectors under test.
   To obtain a rail pressure variation at constat test bench speed , it is necessary to change value of current applied to DRV valve (pressure regulator valve) on rail.

   ▪ At beginning of this test DGIC will display 40% of current is applied to DRV , operator could increase- decrease this value , so increasing – decreasing rail pressure acting on keyboard narrows.:
      • Up narrow   =   pressure increase;
      • Down narrow   =   pressure decrease

      • HP button   =   On – Off DRV

Depending from brand and type of injector under test , value for NOP , generally speaking lies in the range of 80 > 250 Bar

4. Push (STOP) when NOP is acquired for all injectors.
5. Pusch (STOP) again to come back to (select test menu)

SPR" (spray test)

Fig. 9   spray test selection

Pusch (START)
Help instruction :

Injectors correctly positioned with all components of common rail sistem ready to start testIf ready pusch (START)

Spray test is usefull for many reasons:
▪ Fill up all lines.
▪ Check for system leaking
▪ Check injector spray, correctly operating, at different pressure
▪ Stabilizy common rail system components for temperature (40° C.)

Pay attention.

Common Rail systems should be operated with maximum attention to avoid injures to operator.

At (START) DGIC shows.

◦ Test selected ;

◦ Injector code;

◦ Icons for the four test to be actuated:

- "SPR.1" – "SPR.2" – "SPR.3" – "SPR.4"

◦ To move troghth test use right – lefth arrows.

▪ Heach test will be run at presetting value for (stroke) and (pressure)as for selected test plan.

▪

▪ To change setting of (stroke) or (pressure) at will , pusch (F) button, select value tob e modified with rihth – left arrows, and modify presetting value with (UP) – (Down) arrows.

▪

▪ To exit manual presetting pusch (F) again to come back to SPR.1 – SPR.2 – SPR.3 – SPR.4. menu.

▪ It is also possible to change presetting value either for (stroke) or (pressure) during execution of test , example SPR.1 selecting (F) button

Fig. 10   Spray test at different rai pressure

Select (START) to begin test
During this phase, current set for DRV is preset at 40% of it's maximum value.
RPM for test bench should be adjusted from operator.

Rail pressure is a function of DRV setting but could be adiusted from operator at will :

▪ On this test presetting value for DRV valve is 40%, operator can change this value with:
  • Up narrow   =   "increase pressure"
  • Down narrow   =   "decrease pressure;
  • HP   =   "On – Off DRV"
  • When test is completed , select (STOP) to come back to select test menu
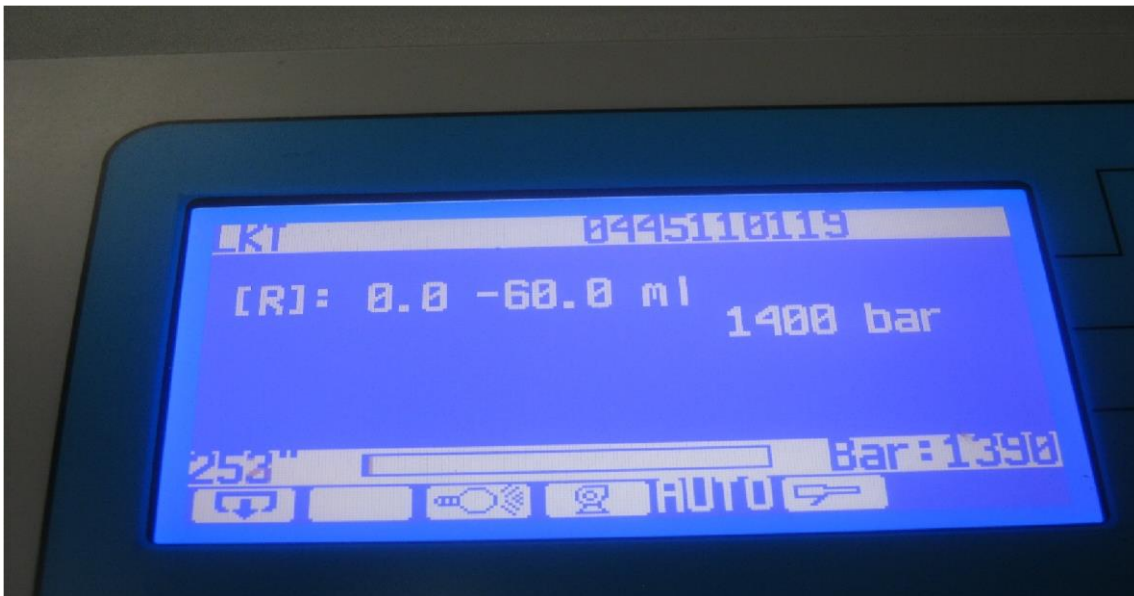
  "LKT" test

Fig. 11   leak test reading value

• Select (LEAK) test ,
• Select (start.)
• The (HELP) instruction will ask operator as usual to check for correct positioning of common rail component.
• Verify that   injector lines for (D) delivery, (R) back leak are connected to respective reading glass on test bench.
•
  Note:

- Leak test is run to maximum pressure establisched for the injector under test , to evaluate internal leaking of injector.
- A value of leaking out of tollerance as for test plan will give evidence of a fault injector, engine will have difficulty to start or will not start at all.
-
- During this test, there is not any current applied to injector coil, so there should not be any drop of test oil leaking from injector nozzle.
- Back leak value coud be evaluate from corrispective reading glass on test bench, compared as for test plan value seen on DGIC.
  This test can be run with injector nozzle cups inserted on injector tips , in this case be sure that all (D) delivery lines or (R) return lines are full of test oil before take a reading value.

  If injector caps on nozzle are not inserted, than there should not be any drop of test oil been seen from nozzles.

  WARNING :

  PAY ATTENTION, NEVER TOCH NOZZLE INJECTOR TIP DURING THIS TEST TO EVALUATE LEAKING, IT SHOULD BE VERY DANGEROUS IN CASE OF SUDDENLY NOZZLE SPRAY.

"If ready, select (START)

On this screen it will be seen:

- Name of selected test (LEAK)
- Injector code for injector previosly selected;
- Range of value for Back leak (R) value.
- Running time   in second for this test
- Actual rail pressure from rail pressure sensor.
-

 Pusch (START) to begin

- DGIC acts a count down for 15 seconds and instruct operator to empty /drain glass on test bench, or select (STOP)to jump next step.
○ Glass draining will act for 15 seconds before DGIC Sw will give current to DRV valve to get rail pressure as for presetted value in test plan.
○ If (STOP) is selected during this fase there will not be any lag of time for DGIC Sw to drive DRV valve.
○

- Running in automatic mode the DGIC SW will shov target rail pressure, as for test plan fort he injector under test, and in the bottom right corner of screen the actual effective rail pressure value from rail pressure sensor.

-

- Until the effective rail pressure value will not be the same, as for target pressure stated from test plan, the DGIC Sw will drive current to DRV valve trying to get the correct target pressure.
- Current drive for DRV valve,will stand untill maximum current is reached, than stops.
- If target pressure could not be raised, there could be many reason:

- Common rail pump fault, not giving enougth pressure or enougth test oil volume to rail.
- Leaks from high pressure lines or high pressure components
- Injector leaking either from (D) line or out of tolerance leak from (R) back leak injector port.
- Other.
- If anythings run correctly, pusch (START) when target pressure and actual rail pressure are similar.
- Effective LEAK test will start and count down will count for 45 seconds.
- It is suggested to repeat this test twice to be sure that collecting lines from injector to test bench glass are full of liquid.
- At the beginning of 45 seconds count down the operator schould position the test bench reading glass either manually or trougth specific circuit to reading position so that test oil from (D) lines and (R) lines could fill glass.
- At the end of this test , operator should compare test oil leak values obtained as for values stated on test plan .
- At the end of test , if in automatic mode , the DGIC Sw will stop to drive current to DRV valve waiting for imputs from operator.

- Pusch (STOP) to come back to test selection menu.

2. "iVM" test

Fig. 12 selecting IVM test

- As usual after selecting test executed , pusch (START)

- The (HELP) instruction will ask the operator as usual to check for correct positioning of common rail component.
- Verify that   injector lines for (D) delivery, (R) back leak are connected to respective reading glass on test bench.
- No leaking from any common rail components
- Lines have been flusced, and the complete system is operating at correct temperature as stated from test plan.
-
  Main aim for i VM test, is to evaluate correct operation as regard (D) delivery and (R) back leak or return values for injector under test at different operating setting as stated from

DGIC test plan, then compare reading obtained from different test at different setting over full range of injector operating, with test plan values tollerances.

◦ If ready pusch (START)
◦ DGIC Sw will start system to set correct test oil temperature and flush lines.

Next step from DGIC Sw , after completing of setting parameters will present iVM test page screen:
In this screen:
Name of test to be executed (i VM)
Code of injector as previosly chosed
Icons of four iVM tests
VTP. 1 – VTP .2 – VTP . 3 – VTP. 4

Use right – lefth arrow to move troughth tests

For each VTP test , there will be shown preset values for test bench stroke and rail pressure target pressure as for Sw test plan .
 To modify setting values of stroke and pressure, pusch (F), select value to be modified using rigth – left arrow, than change value using up –down arrow.

Pusch (F) again to exit setting parameters and come back to selecting VTP.1 – VTP.2 – VTP.3 – VTP.4. test.

Note:
If test , example VTP – 1 is running, it is not possible to modify parameters setting of stroke and pressure.

DGIC screen will instruct about:

Time for test to be run
Actual pressure value in bar in the right bottom corner
Command,(Pusch start to begin test)

Selecting (START) there will be a countdown of 15 seconds, during this time, operator should drain test bench glass or push (STOP) to start next test.

If (STOP) is pusched, DGIC Sw will at once drive current to DRV valve to get target pressure as stated from test plan.
At the moment that effective, actual pressure as visualized on the right bottom corner window is obtained pusch (START) to begin test.

Very important note:

DGIC functionality good results , depend from test bench , test bench could be of any tipe but be sure that can stand the job of common rail injector testing, that means:

Enough power to drive common rail pump at stable RPM

Good working test oil cooling system, to keep test oil preset temperature value stable for duration time of test.

Very accurate glass or electronic timer system to give the most precise test oil value reading of delivery and back leak from injector.

Clean, well serviced at regular interval of time

Other

Remember:

It is the operator duty to set test bench RPM, or operate injector glass system either manual or electronically in the best way to allow DGIC Sw to drive common rail injector system test in the most positive way.

After (START) is selected, (VTP- 1) test can begin.

• DGIC display page will show:

- Name of test (iVM)
- Code of injector previosly selected
- Test plan values for injector (D) delivery and (R) return or back leak
- Name of test running , example (i VTP – 1)
- Value of parameter setting for (STROKE), (Time for pulse in microsecond), (pressure in bar)
- Countdown time for test execution
- Actual effective rail pressure

  - Count down before effective test starts is 15 seconds, this delay time is used from DGIC to fill up lines ready for measurement.
  -
  - At countdown (zero)the test bench metering system should be operated either manually from operator or electronically from any means to collect delivery test oil and back leak from injectors for duration time of test as estabilisched from Sw test plan. .
  - At the end of test (Example VTP-1) DGIC will put itself in stanby mode, waiting for operator next command.
  - During this time DGIC display will instruct to verify values obtained for test (VTP- 1)
  - Reference test plan values on display will flash
  -
  - Take note of value obtained for delivery and return lines from injectors
  - Compare effective values with flasching values from test plan.
  -

- Repeat i VM test sequence to obtain delivery and back leak result for injectors under test for "VTP.2" – "VTP.3" – "VTP.4".
- When all test have been completed, pusch (STOP) to come back to select test menu.
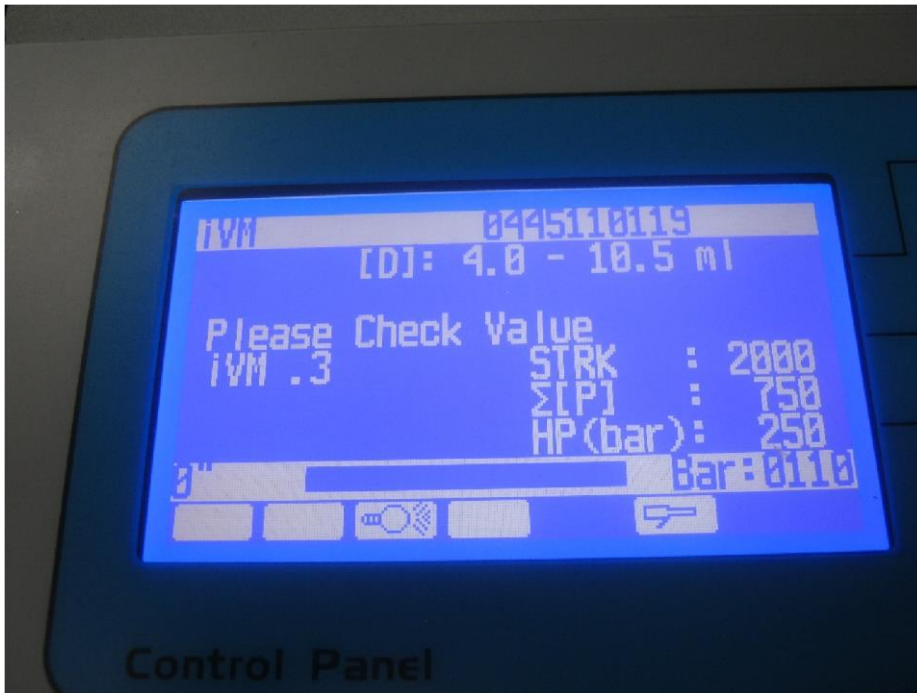

Fig. 13   i VM test page

"RSP" test

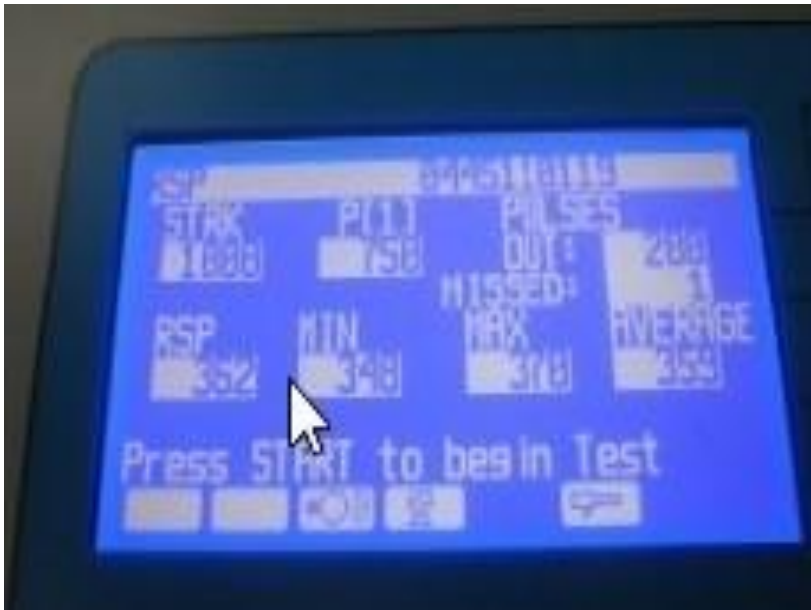NOTE:This test could be executed only if RSP sensor kit is available

Fig. 14 RSP test page

- After having selected (RSP) test,pusch (START).
-
- DGIC screen will present as usual the (Help) instruction.
- All the same as usual help screen, but this time there is a command to position the RSP kit sensor on injector nozzle tip and take care to connect (D) and(R) return lines to respective reading glass on test bench.
-

Note: RSP kit sensor cable connector should than be connected to respective port on the DGIC back panel .

    ◦ When ready pusch (START)

On this screen DGIC will show:

Name of selected test

Code of injector previosly selected

Parameter setting to start test:
- STRK, P, TRIG e SLOPE;

Fig. 15   RSP test page

Note.
Main aim of this test is to analize the complete injector as a unit during many working cicles.

 The DGIC Sw will send an electrical pulse of specific parameter to injector coil , at preset rail pressure,injector nozzle will than make a spray, SRP sensor kit installed on tip of injector nozzle, will take note of any pressure variation in the line sensor due to nozzle spray, compare number of pulse sent to injector coil to number of injector nozzle spray as releaved from RSP sensor
.
DGIC screen will than visualize:

- Number of pulses sent to injector coil
- Number of spray from nozzle tip as sensed from RSP sensor
- Any difference in number from coil event and nozzle events
- Lag of time from injector coil trig and injector nozzle spray
- Average of lag time for number of events controlled

- Working parameters for this test are presetting from DGIC Sw but could be chanced from operator at will.
- To modify parameters pusch (F) and select arrow for rigth – left – up – and down.
- MIN, MAX ed AVERAGE;
  - ▪

- Pusch (START) to begin test

- DGIC Sw will stabilize rail pressure as for test plan or manual imput from operator,send a pulse to injector , than start to take record of parameter funtion .

- When test is in progress DGIC display will show:
  ◦ "<START> = RESET "
  ◦

  • The same procedure should be repeated for all injector under test.
  • At the end pusch (STOP) twice to come back to menu selected test.

3. "IRVL test

NOTE:

 IRVL test, should be checked for functionality before any other injector test, on a workshop table, using   kit tool P/N AAZ006 (concrete base tool for millesimal digital gauge and accessory, resolution 0.001 millimiters) or better, adopting a complete common rail injector overhall testing kit P/N AZ 0352- CR that will allow a complete disassembly, assembly and overhall for most of all makes common rail injector.

Fig. 16 IRVL selecting page

- Position injector under test on ficture kit P/N AZ 0352 – CR taking care of linearity of the tasting gauge pin inside injector coil space.
- Connect connector cable for IRVL test to DGIC IRVL sensor port. •   As usual from selection test menu, chose IRVL test Note:

Main aim for this test is to compare injector internal opening valve ball, (maximum elevation of injector internal ball) for a specific CR injector, comparing this value with manufacuring value for the same type, new brand injector.

This value,(maximum elevation of internal ball valve) is representative of all injector internal components functionality, it can be easily obtained, without dismantling the injector under test using our CR complete overhall kit P/N AZ 0352 – CR.

- Pusch (START)
- Follow up help instruction from DGIC
- When ready pusch (START)

DGIC screen will show :
   ◦ Name of selected test (IRVL)
   ◦ Injector code previosly selected
   ◦ Preset parameters for IRVL execution
   ◦
- IRVL signal   (Ex.1000) in millisecond;
- IHOLD: (Ex.:10.0) Amps;
     ▪ Preset parameters are easy changed at will from operator pusching (F) and selecting arrows   up- down / left – right. After parameter change, pusch again (F) Pusch (START) to launch IRVL test

     Note:
     Every time that (START) is operated, DGIC Sw will imput an electrical signal of preset value as regard time in millisecond and current (Amps) to the injector coil. This signal will produce as a result, a magnetic field force inside the injector that will make the internal valve ball move from it's seat position to maximum elevation.
     At this point the operator should take note of maximum ball raising, as registered from millesimal digital gauge (0.001 millimiter range)tasting pin that have been previously installed inside injector passing trough injector back leak port.

     Note:
     This test is very easy to obtain, repeat it many time for repeatibility of results.

Take care that injector under test is well fixed in it's ficture , and that millesimal digital gauge tasting pin movement is freely inside the injector coil.
Be sure to register (zero) starting point of digital millesimal gauge before starting IRLV test.

To exit IRLV test and come back to home page, pusch (STOP) twice.

Select the On – Off DGIC switch to (Off) to cut down power to DGIC .