

# Common Rail R-L meter CRLR300

## Instruction manual

### General description

Ditex Common Rail R-L meter device is used to measure the electrical parameters – resistance and inductance of valves, injectors and solenoids. This tool is suitable for all Common Rail systems including Bosch, Delphi, Denso and Siemens. It is used for more advanced diagnostic on individual electromechanical components by measuring their electrical parameters. To measure the desired parameter of a Common Rail actuator there is no need to remove the component from the electrical circuit. Only one of the two wires to the solenoid actuator must be disconnected before measurement.

### 1. Ground wire resistance measurement

Today's vehicles are a combination of metals, spot welds, glued together panels and isolated chassis components. The ground return through these components is where the resistance reading comes into question and here comes the Ditex CRLR300 tester to help finding ground related problems. A "good ground" is a ground circuit that has a resistance close to zero ohms (usually as low as 0.5ohms but it depends on the current flowing through the circuit). Most often "bad ground" occurs at the points where the ground cables connect to the vehicle chassis due to poor contact, moisture, paint, rust and etc. A poor ground connection or high resistance reading may seem trivial under no load, but when a large current flow, this little reading has a significant importance!

#### Measurement procedure:

- 1. Disconnect the positive battery terminal!**
- 2. Connect the CRLR300 LR meter power supply cable to the car battery.**
- 3. Switch to R mode**
- 4. Connect the test leads to Rx and COM terminals and make a short circuit between them.**
- 5. Push the Zero button and release it.**
- 6. Remove the short circuit between the test leads.**
- 7. Connect the first test lead to the questionable ground point and the second test lead – to the negative battery terminal.**

Other possible measurement configurations are:

- between the negative battery terminal and the alternator housing
- between two chassis ground points

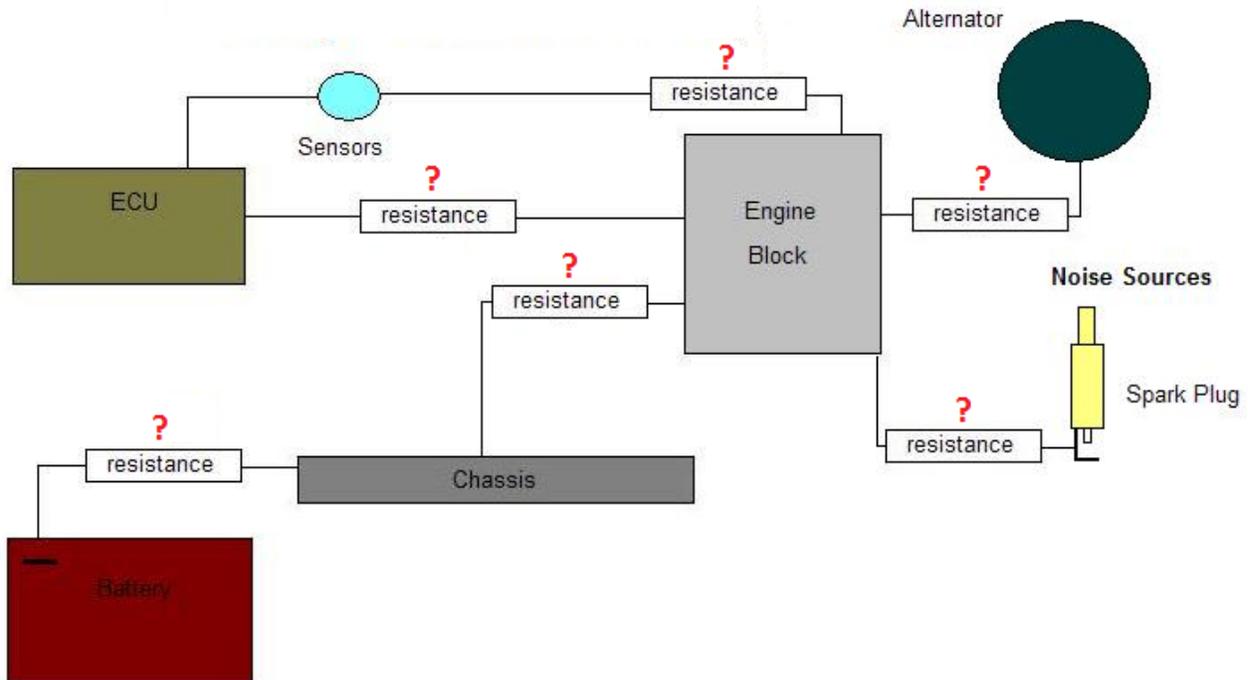


Fig.1 GROUNDING OF A COMMON VEHICLE SETUP

**Important note:** Resistance cannot be measured accurately on a "live" circuit. All current flow through a circuit must be stopped by disconnecting its power source before measuring resistance!

## 2. Accurate measurement of the glow plugs resistance

Glow plugs play an important role in modern diesel engines. They work with such low compression that post-heating is required. This is only to ensure concentric running of the engine with reduced fuel consumption and lower emissions.

### Measurement procedure:

1. Disconnect the feed cable from the glow plug you are about to test.
2. Connect the CRLR300 LR meter power supply cable to the car battery.
3. Switch to R mode
4. Connect the test leads to Rx and COM terminals and make a short circuit between them.
5. Push the Zero button and release it.
6. Remove the short circuit between the test leads.
7. Connect the first test lead to the glow plug active end and the second test lead – to the glow plug housing.

### **Resistance reading depends on the car model:**

Resistance  $\infty \Omega$  (infinite): Malfunction - Glow plug defective

Resistance  $< 0.2 \Omega$ : Malfunction - Glow plug defective

Resistance  $> 0.2 \Omega$  and  $< 5 \Omega$ : Glow plug OK

## **3. LPG and CNG solenoid valves inductance measurement**

Most often there are two solenoids in common LPG/CNG systems:

### **- Tank solenoid**

By default is closed (not energized). If required allows simple disconnection of feed and fill pipes (to engine bay and LPG filler) without Fuel escape and is only open when engine is running.

### **- Vaporiser Solenoid**

By default is closed (not energized). If required allows simple disconnection of LPG pipe from filter to vaporiser in the engine bay and is only open when the engine is running.

LPG/CNG solenoid valves often get damaged because its large inductance generates a reverse voltage during on and off switching. This voltage spike can break down the insulation in the solenoid causing windings to short and overheat. As a consequence, the solenoid magnetic strength weakens and it is not opening up enough when energized.

### **Measurement procedure:**

- 1. Disconnect the LPG/CNG solenoid valve connector(s)**
- 2. Connect the CRLR300 LR meter power supply cable to the car battery.**
- 3. Switch to L-mode**
- 4. Connect the test leads to Lx and COM terminals.**
- 6. Connect the first test lead to one of the valve ends and the second test lead – to the other valve end. Inductance reading should be between 5mH and 9mH depending on the valve being tested.**

## **4. Total circuit parasitic contact resistance measurement**

Contact resistance measurement and his application domain are fairly extensive. At the electric, the connection of circuit have various ways and means, such as connected by welding, by pressing, by plug in and blot tightly and so on. The contact resistance was often applied in quality testing of switches, relays and PCB pads.

To measure the total parasitic contact resistance of a certain circuit you need to disconnect both ends of the circuit and connect the LR meter between them. Circuit can contain multiple wires and connections (connectors) and the total resistance is the sum of the resistance values of all these components between the measuring points.

### **Measurement procedure:**

- 1. Disconnect both ends of the circuit between which you want to measure the resistance**
- 2. Connect the CRLR300 LR meter power supply cable to the car battery.**
- 3. Switch to R mode**
- 4. Connect the test leads to Rx and COM terminals and make a short circuit between them.**
- 5. Push the Zero button and release it.**
- 6. Remove the short circuit between the test leads.**
- 7. Connect the first test lead to one end of the circuit and the second test lead – to another end of the circuit being tested.**

Resistance reading should be less than 0.1ohms depending on the length, thickness of the wires and the number of connections (connectors) in the circuit.

**Important note:** Resistance cannot be measured accurately on a "live" circuit. All current flow through a circuit must be stopped by disconnecting its power source before measuring resistance!

## **5. Measuring electrical resistance of Common Rail solenoid injectors**

Typical common rail diesel injector solenoids will have a resistance of 1 ohm or less. This resistance will waste, as heat, a portion of the energy supplied to the solenoid. It also affects the maximum current achieved in the coil, which depends on the voltage applied. In general, lower solenoid resistances are better for common rail solenoid injector applications.

### **Measurement procedure:**

- 1. Disconnect the solenoid injector connector (if you are trying to test it directly on a car)**
- 2. Connect the CRLR300 LR meter power supply cable to the car battery.**
- 3. Switch to R mode**
- 4. Connect the test leads to Rx and COM terminals and make a short circuit between them.**
- 5. Push the Zero button and release it.**
- 6. Remove the short circuit between the test leads.**
- 7. Connect the first test lead to one of the injector ends and the second test lead – to the other injector end. Resistance reading should be 0.1-1 ohms depending on the injector being tested.**

## 6. Measuring electrical resistance of Common Rail solenoid valves

You can test internal resistance of valve solenoid winding of the following common rail valves:

- rail pressure control valve or Bosch CP1 pressure control valve
- Bosch CP3 quantity control valve also known as fuel metering unit (ZME) or fuel metering valve
- Bosch CP1H quantity control valve also known as fuel metering unit (ZME) or fuel metering valve
- Denso pump control valve (PCV)
- Denso suction control valve (SCV) – normally open type and normally closed type
- Delphi inlet metering valve (IMV)
- Delphi high pressure valve (HPV)

Solenoid valve	Part No:	Resistance – typical value
Bosch rail pressure control valve	0 281 002 507	3,7 Ω
Bosch CP3 quantity control valve	0 281 002 483 0 928 400 487 0 928 400 660	2-2,7 Ω
Bosch CP1 pressure control valve	0 281 002 243 0 281 002 493 0 281 002 872	2,5-3,3 Ω
Bosch CP1H quantity control valve	0 928 400 607 0 928 400 802	2,9 Ω
Delphi inlet metering valve (IMV)	9109-903 9307Z523B 9307-501B 9307 501C	5,4 Ω

The table above is showing various common rail solenoid valves and their approximate resistance.

### Measurement procedure:

1. Disconnect the solenoid valve connector (if you are trying to test it directly on a car)
2. Connect the CRLR300 LR meter power supply cable to the car battery.
3. Switch to R mode
4. Connect the test leads to Rx and COM terminals and make a short circuit between them.
5. Push the Zero button and release it.
6. Remove the short circuit between the test leads.
7. Connect the first test lead to one of the valve ends and the second test lead – to the other valve end. Resistance reading should be between 2 and 6 ohms depending on the valve being tested.

## **7. Measuring electrical inductance of Common Rail solenoid injectors**

Typical common rail injector solenoids will have an inductance of 1mH or less. Inductance acts to resist current change through the coil and thus slows down injector opening (activation).

### **Measurement procedure:**

- 1. Disconnect the solenoid injector connector (if you are trying to test it directly on a car)**
- 2. Connect the CRLR300 LR meter power supply cable to the car battery.**
- 3. Switch to L mode**
- 4. Connect the test leads to Lx and COM terminals.**
- 6. Connect the first test lead to one of the injector ends and the second test lead – to the other injector end. Inductance reading should be between 100uH and 1mH depending on the injector being tested.**

## **8. Measuring electrical inductance of Common Rail solenoid valves**

Diagnosis of Common Rail solenoid actuators is extremely difficult without the use of this specialized R-L tester, because it is impossible to use an ordinary multimeter for this purpose.

You can test internal inductance of valve solenoid winding of the following common rail valves:

- Rail pressure control valve or Bosch CP1 pressure control valve
- Bosch CP3 quantity control valve also known as fuel metering unit (ZME) or fuel metering valve
- Bosch CP1H quantity control valve also known as fuel metering unit (ZME) or fuel metering valve
- Denso pump control valve (PCV)
- Denso suction control valve (SCV) – normally open type and normally closed type
- Delphi inlet metering valve (IMV)
- Delphi high pressure valve (HPV)

### **Measurement procedure:**

- 1. Disconnect the solenoid connector (if you are trying to test it directly on a car)**
- 2. Connect the CRLR300 LR meter power supply cable to the car battery.**
- 3. Switch to L mode**
- 4. Connect the test leads to Lx and COM terminals.**
- 6. Connect the first test lead to one of the solenoid ends and the second test lead – to the other solenoid end. Inductance reading should be between 2mH and 6mH depending on the solenoid type being tested.**

<b>Solenoid valve</b>	<b>Part No:</b>	<b>Inductance – typical value</b>
Bosch rail pressure control valve	0 281 002 507	3,7 mH
Bosch CP3 quantity control valve	0 281 002 483 0 928 400 487 0 928 400 660	3-3,5 mH
Bosch CP1 pressure control valve	0 281 002 243 0 281 002 493 0 281 002 872	2,2-3,5 mH
Bosch CP1H quantity control valve	0 928 400 607 0 928 400 802	3,7 mH
Delphi inlet metering valve (IMV)	9109-903 9307Z523B 9307-501B 9307 501C	4,9 mH