

IGNITION SYSTEM

1444-01/1444-03/

INDEX

IGNITION SYSTEM

GENERAL INFORMATION

| | |
|------------------------|---|
| 1. SPECIFICATIONS..... | 3 |
|------------------------|---|

OVERVIEW AND OPERATING PROCESS

| | |
|---------------------------|---|
| 1. OVERVIEW..... | 4 |
| 2. COMPONENTS..... | 4 |
| 3. OPERATING PROCESS..... | 6 |
| 4. WIRING DIAGRAM..... | 7 |

CONFIGURATION AND FUNCTIONS

| | |
|----------------------------|----|
| 1444-01 IGNITION COIL..... | 8 |
| 1444-03 SPARK PLUG..... | 12 |

REMOVAL AND INSTALLATION

| | |
|----------------------------|----|
| 1444-01 IGNITION COIL..... | 14 |
| 1444-03 SPARK PLUG..... | 17 |



دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



IGNITION SYSTEM**1444-01****GENERAL INFORMATION****1. SPECIFICATIONS**

| Category | | Specifications |
|---------------|---------------------------------------|---|
| Spark plug | Internal resistance | 3 ~ 7 kΩ |
| | Center electrode | NGK : SILZKR7B11, HEX16 M12x1.25, Iridium |
| | Ground electrode | Platinum alloy |
| | Electrode clearance | 1.1 mm |
| | Change interval | At every 100,000 km of driving |
| Ignition coil | Primary operating current | 7 ± 0.5 A |
| | Generated voltage (primary/secondary) | Max 400 V / 5 to 20 kV |
| | Ignition type | Independent ignition type |
| | Ignition sequence | 1-3-4-2 |

شرکت دیجیتال خودرو (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

| | |
|--------------------|--|
| Modification basis | |
| Application basis | |
| Allocated VIN | |

IGNITION SYSTEM

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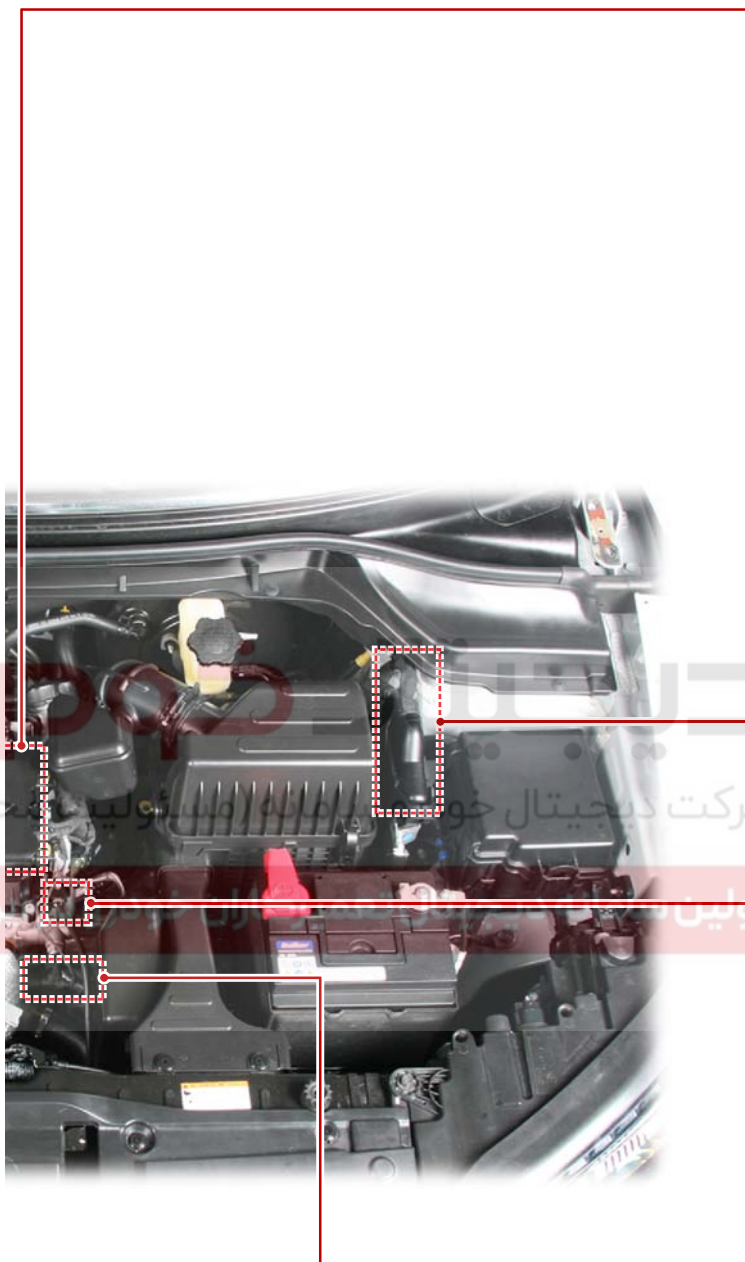
OVERVIEW AND OPERATING PROCESS

1. OVERVIEW

The ignition system is to supply high voltage generated from the ignition coils to the spark plugs. The G16DF engine is equipped with the independent direct ignition system in which each cylinder has its own ignition coil and spark plug.

2. COMPONENTS





Camshaft position sensor (2 off)



ECU



Coolant temperature sensor



Crankshaft position sensor



Accelerator pedal sensor



| | |
|--------------------|--|
| Modification basis | |
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IGNITION SYSTEM

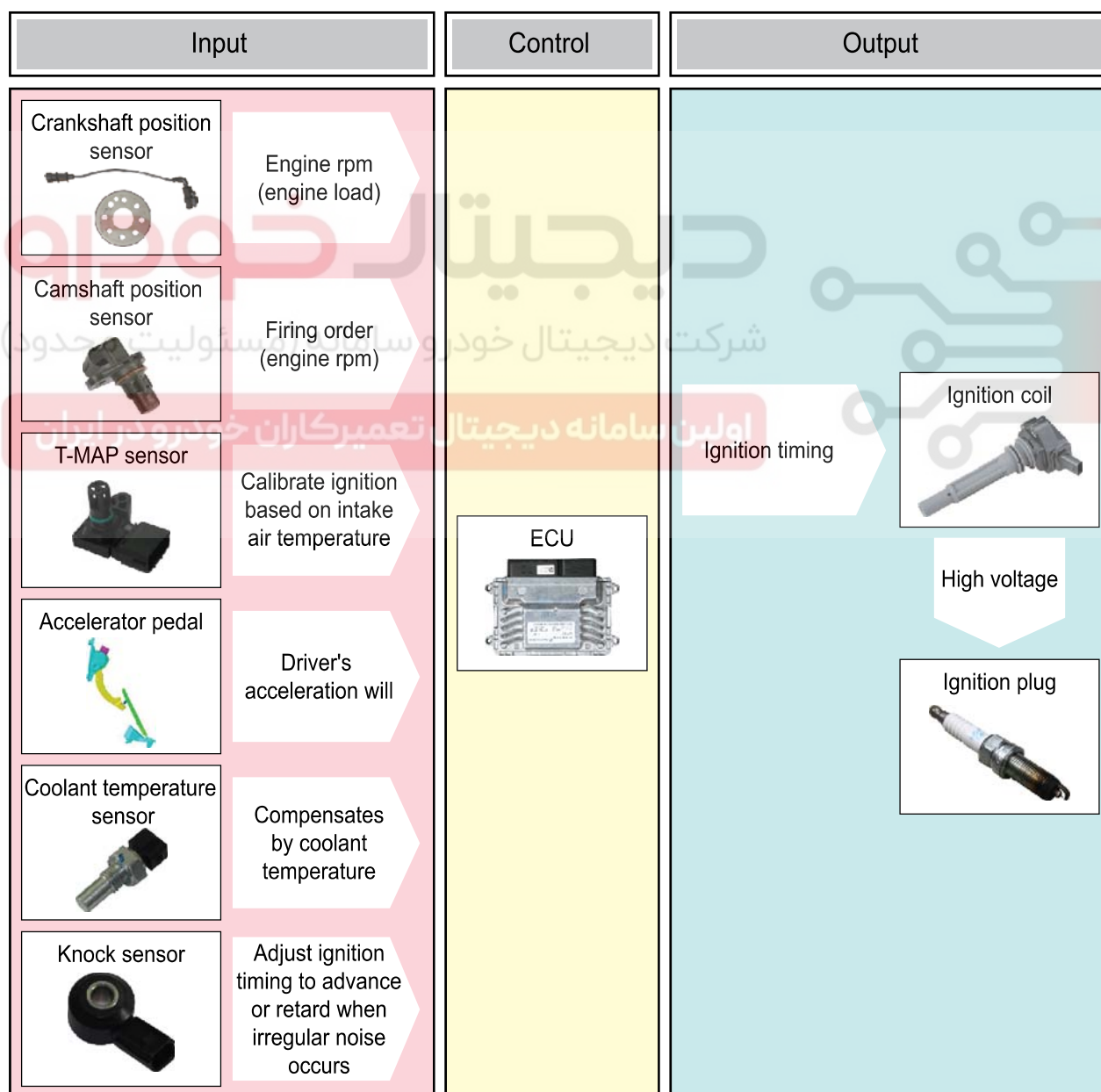
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3. OPERATING PROCESS

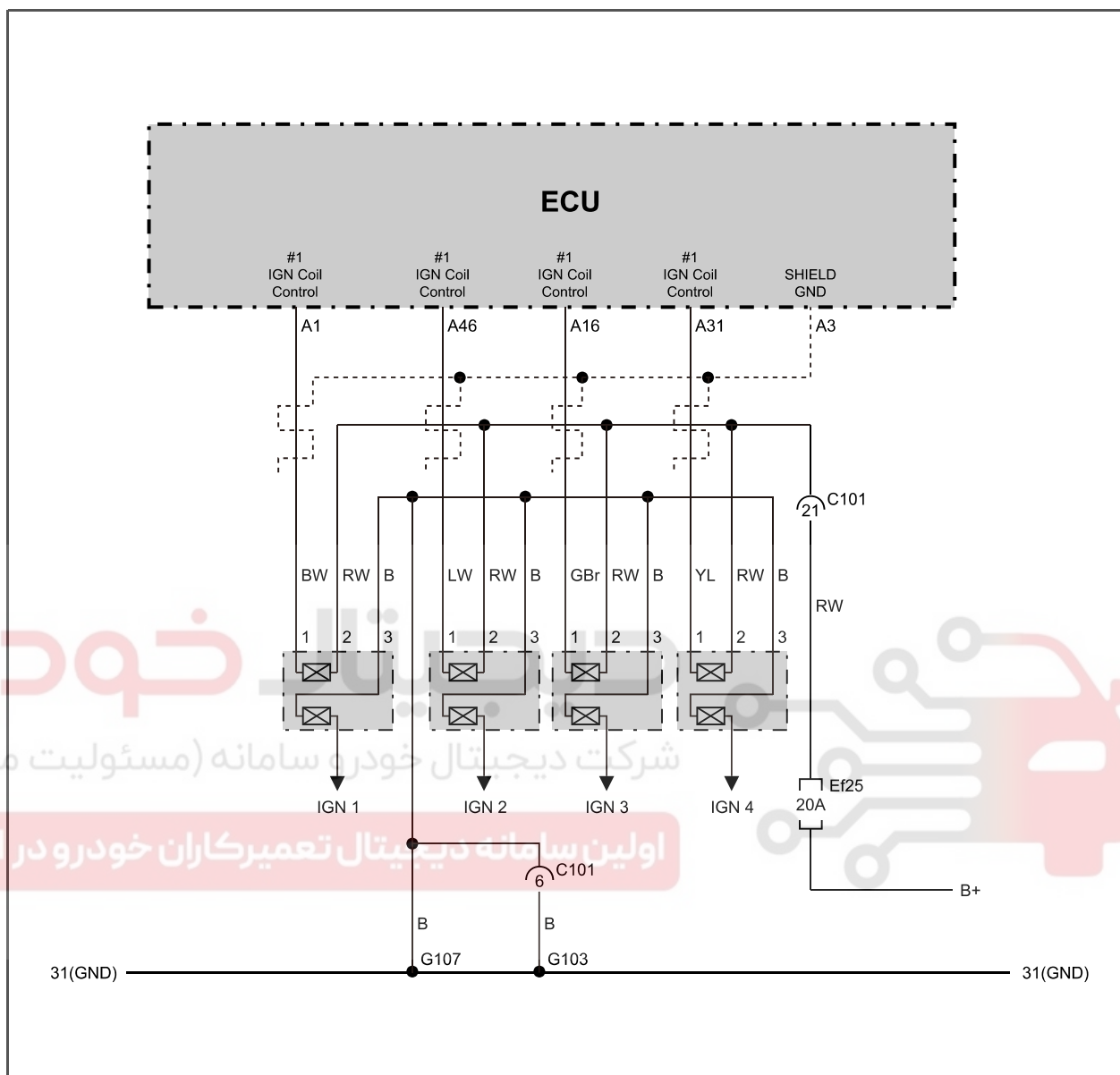
The default ignition timing for each cylinder is determined based on the signals from the camshaft position sensor and crankshaft position sensor. The engine control unit (ECU) controls the ignition timing more precisely by using the following information:

- Engine load
- Coolant temperature
- Intake air temperature
- Engine rpm
- Camshaft position sensor signal
- Crankshaft position sensor signal

If the engine ECU does not receive the signal from the crankshaft position sensor, the ignition coil and fuel system will not work.



4. WIRING DIAGRAM



CONFIGURATION AND FUNCTIONS

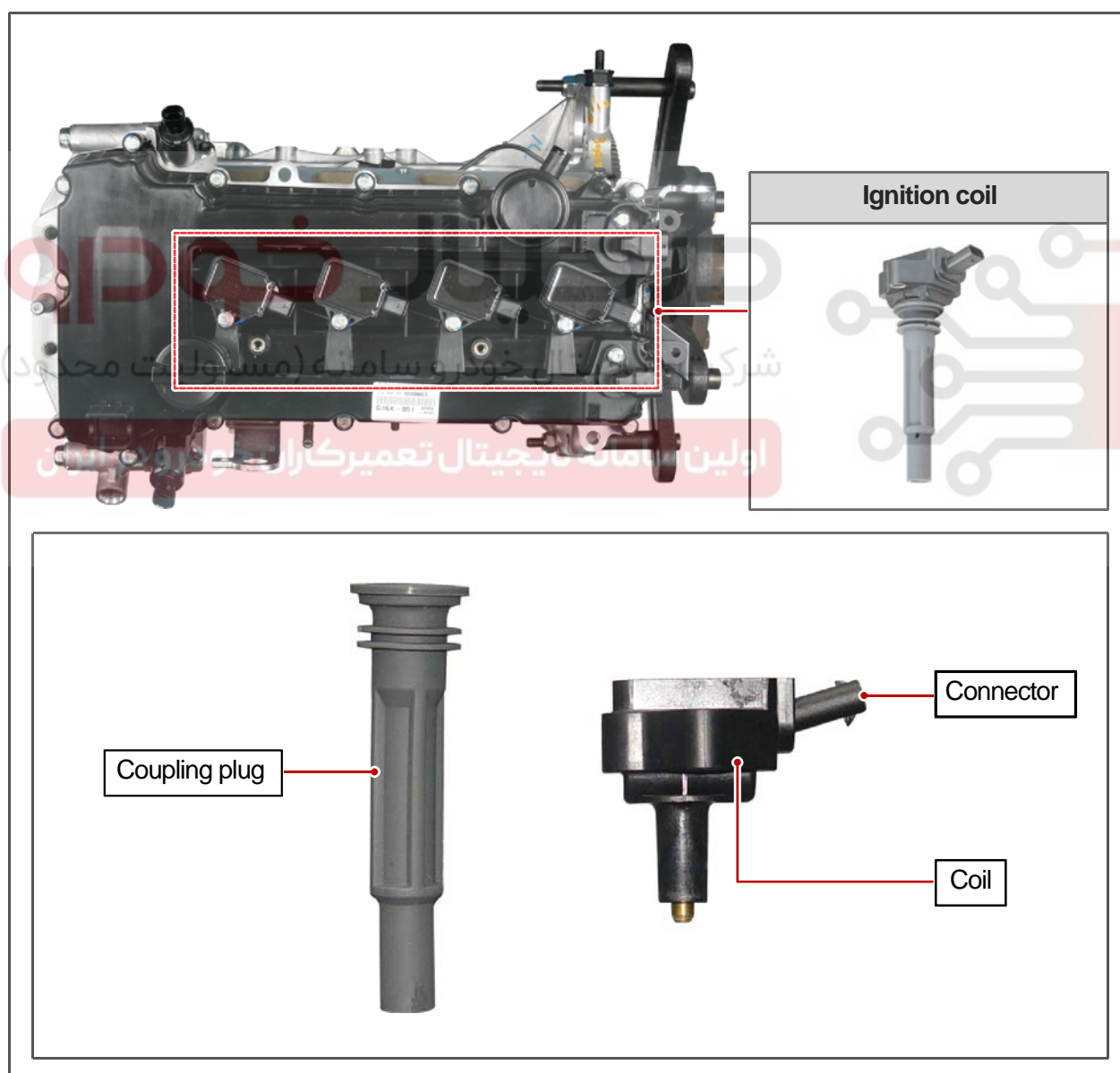
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1444-01 IGNITION COIL

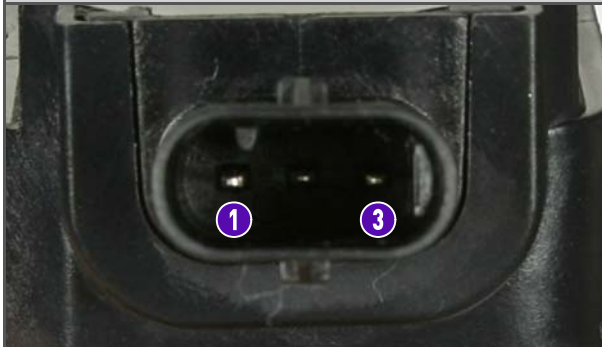

1) Overview

Each cylinder is equipped with an ignition coil. The type of ignition coil is plug-top type which has the coil assembly on the head. The engine ECU sends the ignition signals to each cylinder according to the firing sequence. The compact size of ignition coil and independent direct ignition system minimize the loss of energy.

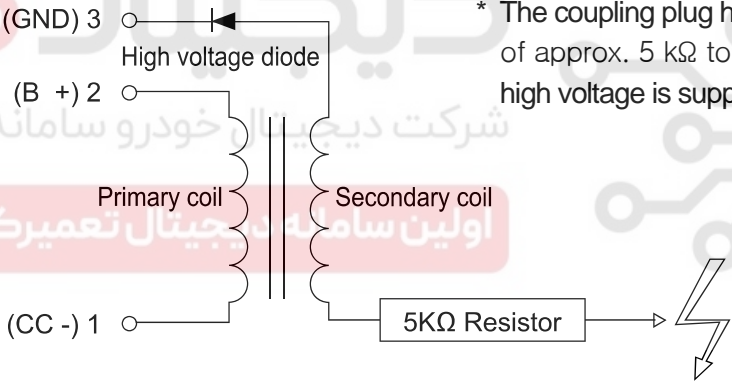
2) Mounting Location and Components



3) Connector

| To ignition coil | To wiring |
|---|--|
|  |  |

| Pin No. | Function |
|---------|---|
| 1 | Ground → Ignition coil signal (ECU primary current control) |
| 2 | B+ |
| 3 | Ignition coil signal → Ground (secondary current ground) |

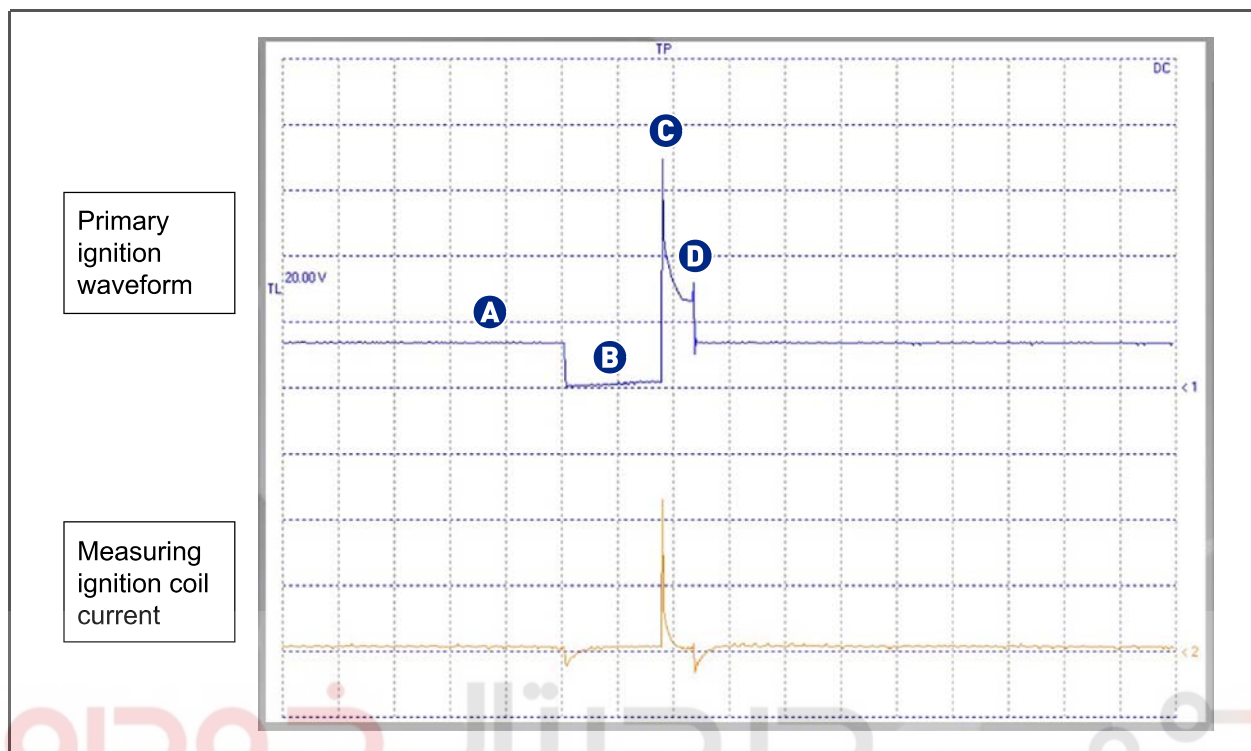


* The coupling plug has a built-in resistor of approx. 5 kΩ to block noise when high voltage is supplied.

| Item | Specifications | |
|-----------------------------|-----------------------------|---|
| Component resistance (20°C) | Primary coil | 800 mΩ |
| | Secondary coil | Not measurable (high pressure diode) |
| Generated voltage | Primary coil | Max 400 V ± 50 V (Clamping voltage: 400 V) |
| | Secondary coil | - Min 30 KV - Min 24 KV (Voltage by wire resistance) |
| Operating temperature | -40°C to 130°C | |
| Operating current | Primary coil: 7.0 A ± 0.5 A | |

| | |
|--------------------|--|
| Modification basis | |
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| Allocated VIN | |

4) Waveform



| Measurement condition | At idling | |
|-----------------------|--|---|
| No. 1 Ignition coil | No. 1 channel | No. 2 channel |
| Measuring method | Measuring probe (+) A1 Measuring probe (-) Body ground | Small current measuring (No. 2 ignition coil wiring) |
| Check method | Inspect the cylinder by exchanging it with the adjacent cylinder to fine the cause of misfire. | |

A. Battery voltage

The ignition coil does not operate with normal voltage of 12 V.

B. Dwell time

The ECU control the dwell time by grounding the wire connected to the ignition coil. The ignition coil burns if the dwell time is too long, while sufficient ignition energy is not supplied if the dwell time is too short.

C. Surge voltage

Provides the electrical path by generating high voltage between the spark plug clearance.

D. Ignition time

A section wherein spark is maintained and that the spark plug is operated actually.

**NOTE**

- Plug condition check (accumulation of carbon deposit or enough clearance)
- Coupling plug and coil condition check
- Too lean air-fuel ratio check
- Too high compression ratio in the combustion chamber check

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

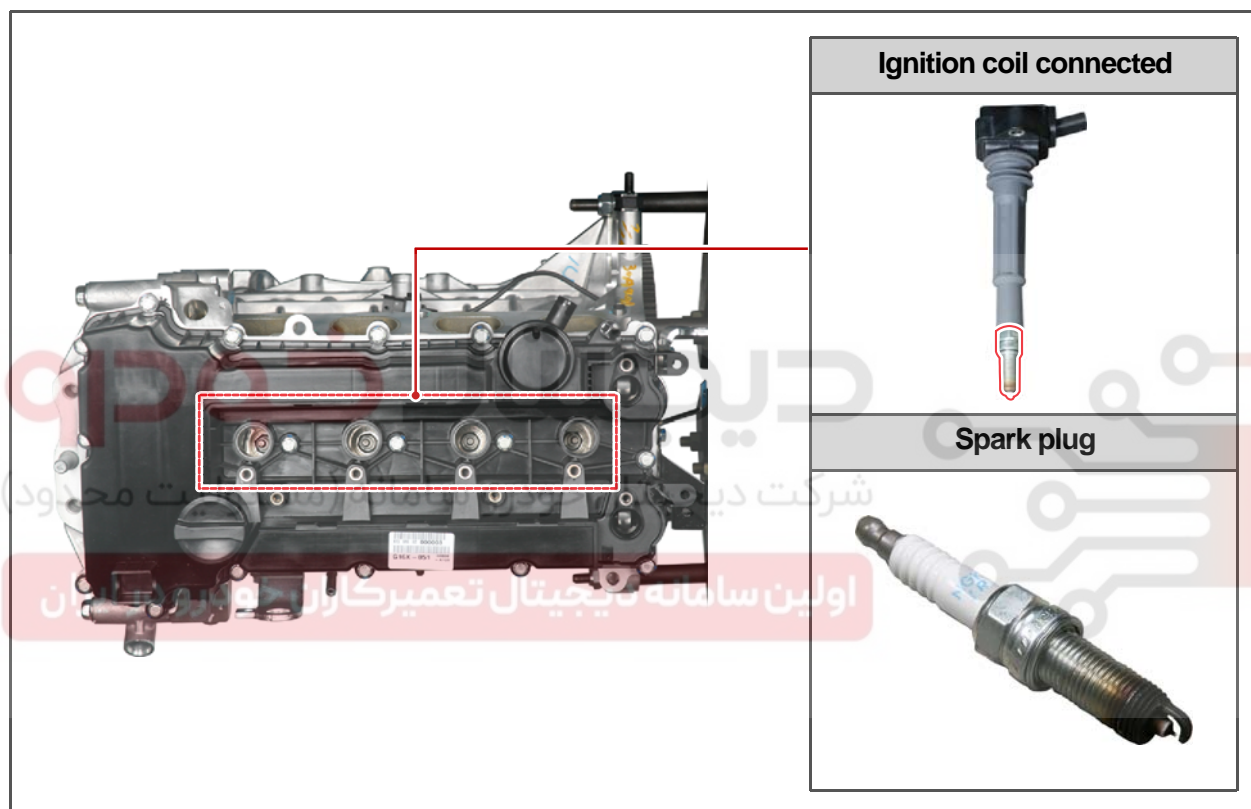
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

| | |
|--------------------|--|
| Modification basis | |
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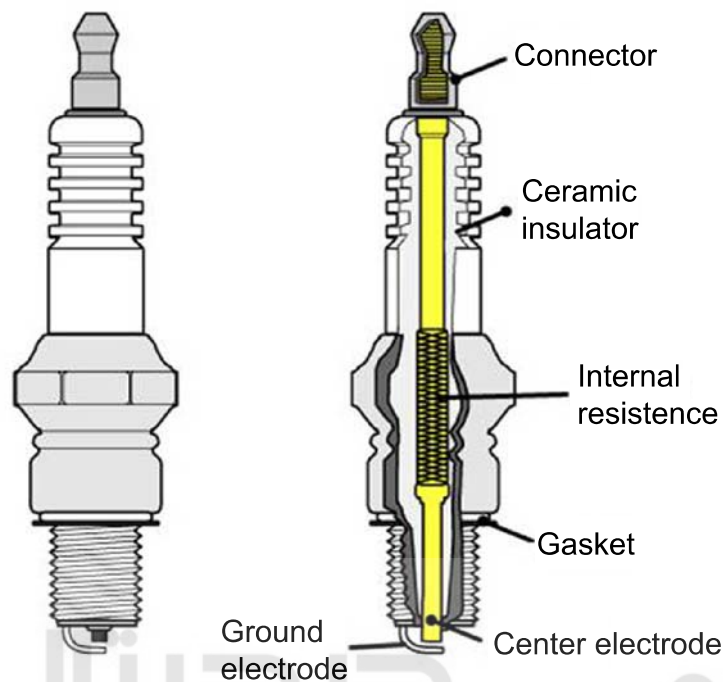
1444-03 SPARK PLUG**1) Overview**

Each cylinder has an iridium spark plug made of Ni-Alloy. The electrodes of the spark plug contain iridium which is good for electrical arc and easily ignitable. This presence enhances the start ability, acceleration and idling performance resulting in improved fuel economy and ignition efficiency.

2) Mounting Location and Components

| Type | Appearance | beginning of ignition | After 3 ms |
|--------------------|------------|-----------------------|------------|
| Iridium spark plug | | | |

Configuration



► Insulating threads

Body of the ignition coil. Is made of ceramic material. Insulates the voltage when high voltage is applied to the center electrode.

► Terminal

Supplies electricity to the connected ignition coil.

► Gasket

Seals the cylinder so that the gas does not leak from the combustion chamber during working stroke.

► Internal resistance

Prevents noise which causes acoustic noises in the audio system and is generated every time the ignition spark is formed at the spark plug.

► Center electrode

This is where the spark is formed by high voltage applied and ignition occurs.
The electrode should handle high temperature with enhanced temperature.
The type and price of the spark plug vary depending on the shape of the tip and material.

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| Modification basis | |
| Application basis | |
| Allocated VIN | |

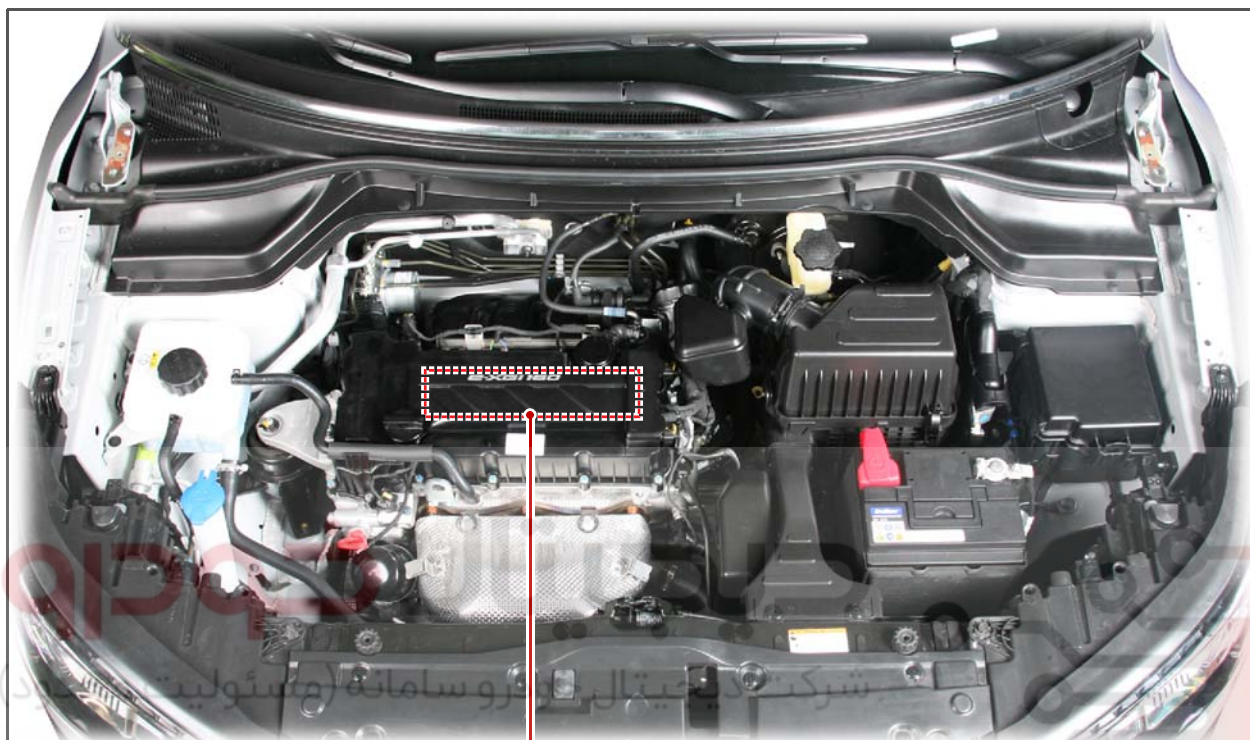
REMOVAL AND INSTALLATION

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1444-01 IGNITION COIL

Preceding work

- Disconnect the negative battery cable.



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Ignition coil

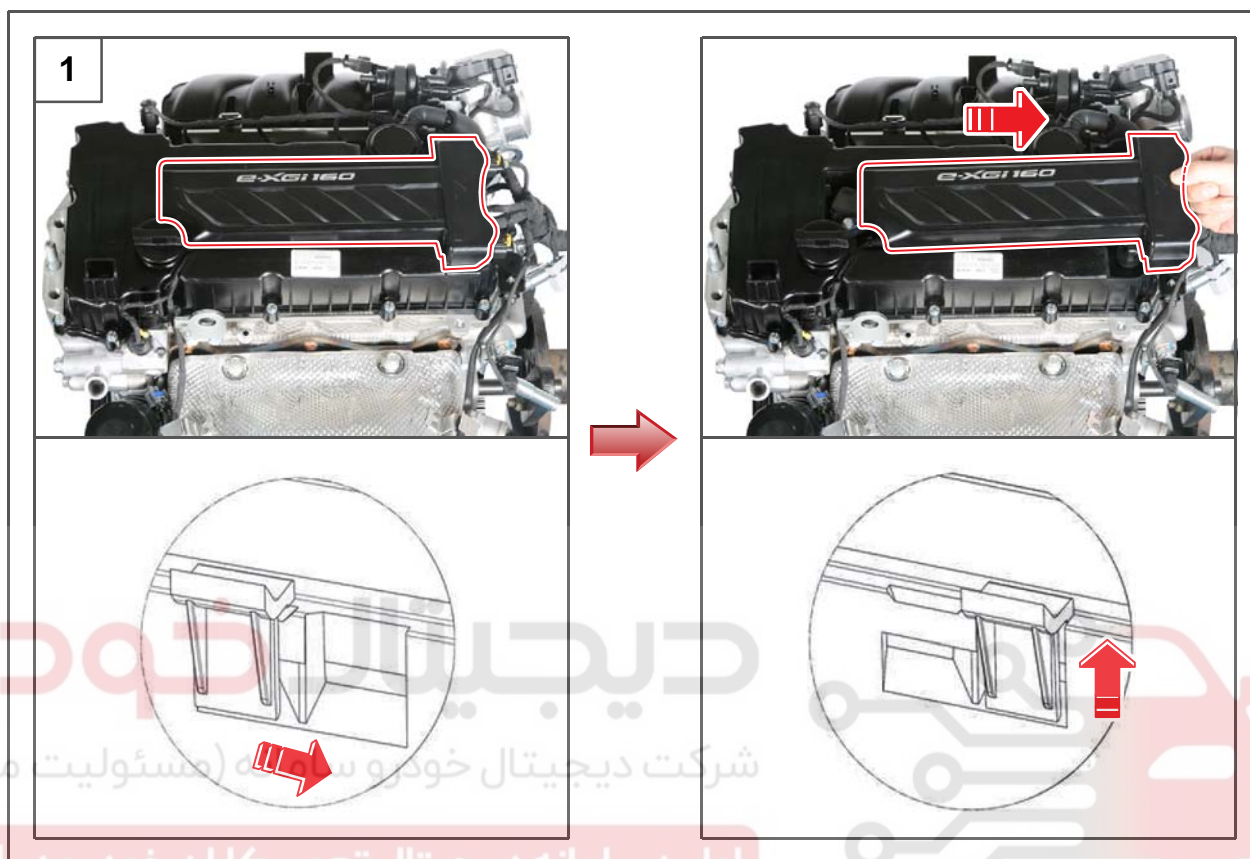


IGNITION SYSTEM

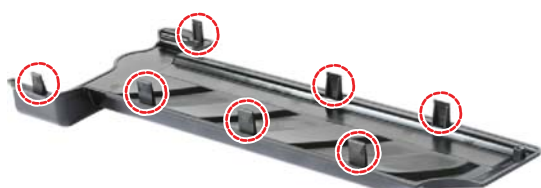
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| | |
|--------------------|-----------------|
| Modification basis | |
| Application basis | |
| Affected VIN | 021 62 99 92 92 |

1. Slide and remove the ignition coil cover in the direction of the arrow as shown in the picture.



Ignition coil cover mountings - 7 points



NOTE

Install the ignition coil cover in vertical direction.

| | |
|--------------------|--|
| Modification basis | |
| Application basis | |
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IGNITION SYSTEM

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2. Disconnect the ignition coil connector.



3. Unscrew the mounting bolt (10 mm) for the ignition coil.

Tightening torque $10 \pm 1,0 \text{ Nm}$



4. Remove the ignition coil.

NOTE

Remove the remaining ignition coils in order in the same way.



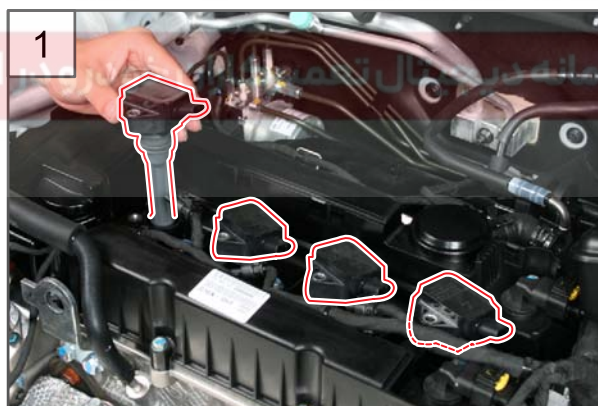
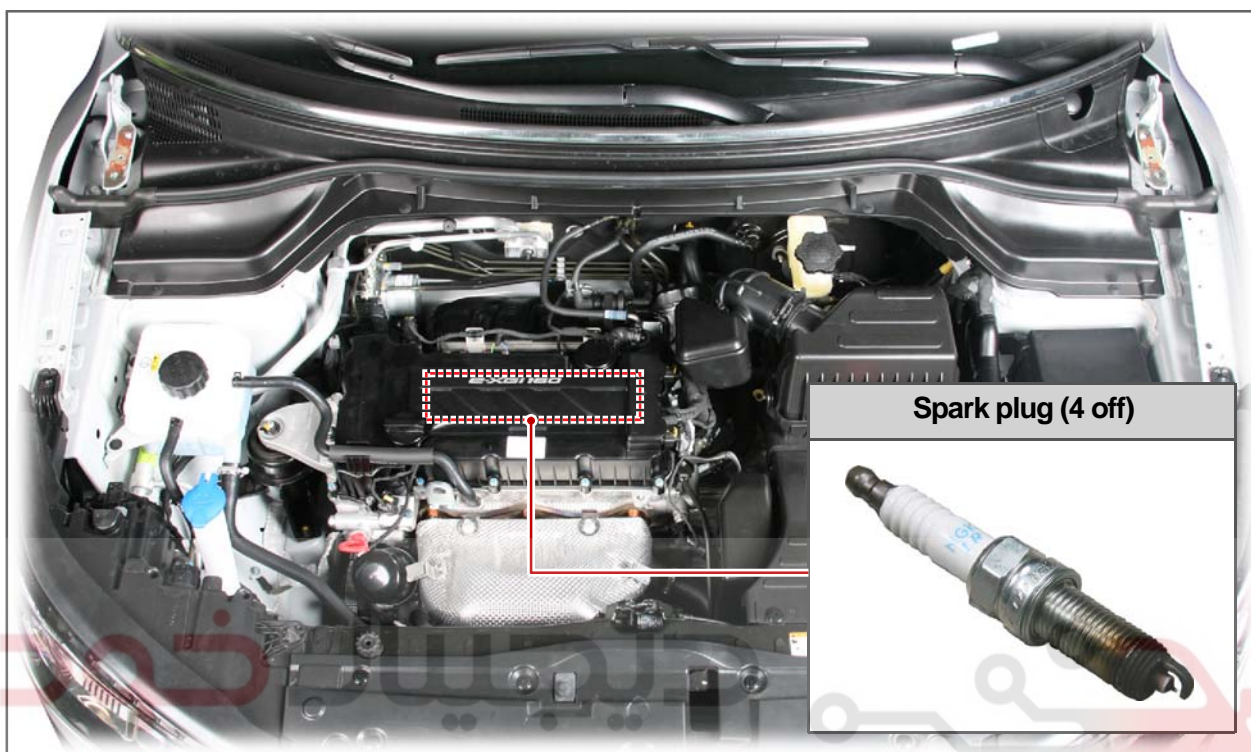
5. Install in the reverse order of removal.

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1444-03 SPARK PLUG

Preceding work

- Disconnect the negative battery cable.



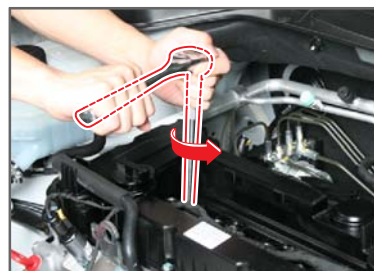
1. Remove the 4 ignition coils in order.

NOTE

Refer to "IGNITION COIL" under this subsection.



2. Unscrew the 4 spark plugs (16 mm) in sequence. (Tool: 16 mm spark plug wrench)

Tightening torque 20 ± 2.5 Nm

| | |
|--------------------|--|
| Modification basis | |
| Application basis | |
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3. Unscrew the 4 spark plugs.




4. Install in the reverse order of removal.

CAUTION

- Ensure that no dirt or foreign material gets into the cylinder after removing the spark plugs.
- When installing the plugs, make sure to follow the specified torque and clean the spark plug holes with compressed air in advance.
- Use genuine spark plugs. Otherwise, ignition system failure can occur.

Spark plug check

| Item | Check | | |
|---|--|---------------------|--------|
| Spark plug electrode  | Wear and clearance between center and ground electrodes <table border="1"> <tr> <td>Specified clearance</td><td>1.1 mm</td></tr> </table> | Specified clearance | 1.1 mm |
| Specified clearance | 1.1 mm | | |
| Color adjacent to spark plug electrode | Black foreign materials: Burnt engine oil <ul style="list-style-type: none"> - Faulty head gasket, leaks in valve guide seal, pores in cylinder block Light black glazing: Fuel leaks - Leaks in injector, misfire by insufficient compression pressure Brown foreign materials: Burnt coolant <ul style="list-style-type: none"> - Cylinder head deformed | | |