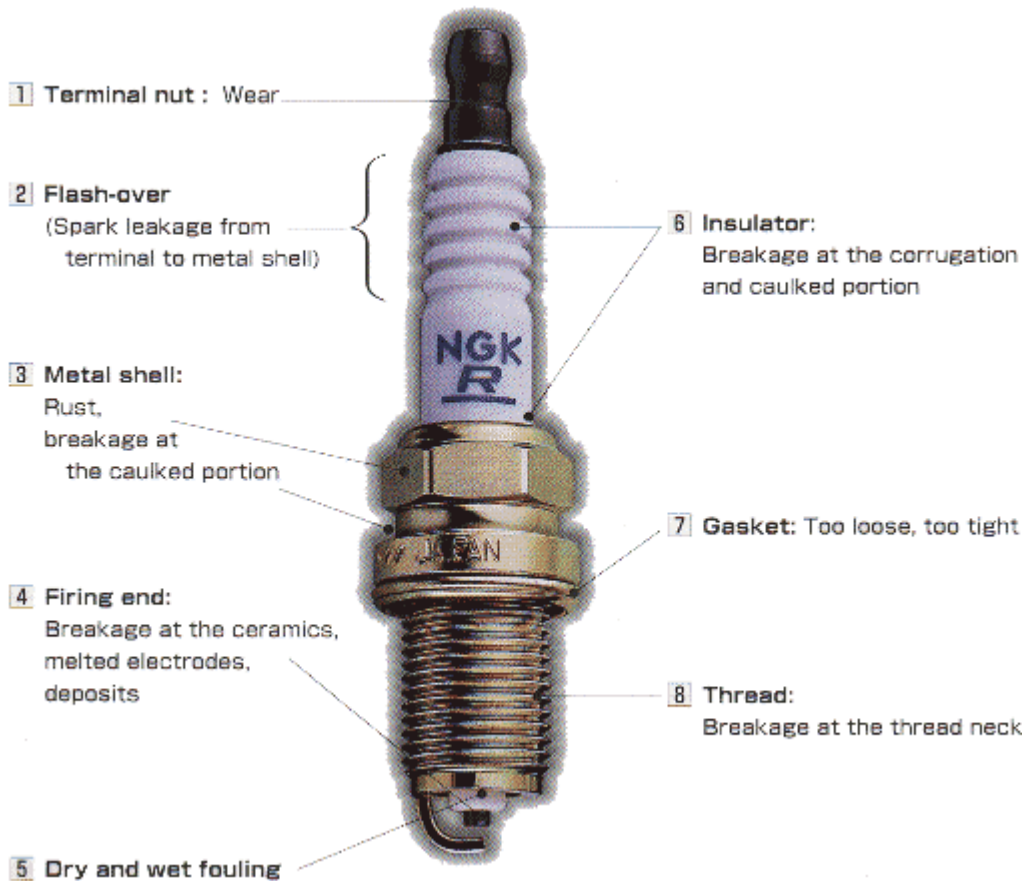


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Appearance of a used spark plug tells a lot about the operating conditions of the engine and the plug. Thus the analysis of a plug plays an important role in the maintenance of a car. Perhaps this information can be used in explanations to consumers.



1 Terminal Nut : Wear

-Excessive vibration of the engine may lead to abnormal wear of the terminal nut. As a result, the cover may come off the plug. For vehicles whose engines vibrate more than others, such as watercraft and snowmobiles, solid post terminal plugs with excellent vibration resistance and wear resistance are recommended.

Wear



Solid post terminal plugs are currently available with five part numbers: B7ES, B8ES, and BR9ES. A special package has been made for solid post terminal plugs.

2 Flash - Over : Spark leakage from terminal to metal shell

Flash-Over



When the spark gap has widened due to wear of the electrodes, a higher voltage is required. The flash - over occurs when the required

voltage between the plug electrodes is higher than the voltage flying between the terminal and metal shell.

The plug cable material hardens as time elapses, which in turn reduces the tightness of the cover and insulator, lowering the preventive power for flash-over.

As a higher voltage is required for a turbo charged engine, flash - over is more likely to occur. It is important to recognize that a plug cable is a consumable part which needs to be replaced periodically. When there is no spark after washing the car or the engine room, check whether water has entered the plug cover or not.

Corona Stain



A removed spark plug sometimes has discolouration around the insulator surface which looks like gases have leaked between the insulator and the shell. This discolouration is generally called "Corona stain" and is caused by the fact that oil particles in the air around the insulator surface are attracted by the corona discharge, are charged, and then adhere to the insulators surface. The corona stain causes no deterioration of the function of the spark plug.

3 Metal shell : Rust, breakage at caulked portion



Rust



The Caulked Portion

When water has entered the plug hole due to water resistance of the plug cover or, in the case of a motorcycle, when water has accumulated due to the inadequate draining through the plug hole, the metal shell may rust.

The rusting of the metal shell causes no deterioration of the function of the spark plug. Note, however, that water inside the cover may prevent sparks from being generated.

If the plug is forced to remove when the returning torque is abnormally high due to some causes such as plug thread seizure, the plug may break at the caulked portion of the metal shell.

When returning torque is high, the engine should be first warmed up. Then, by spraying penetrating liquid around the plug thread and leaving it for a while, the plug can sometimes be removed more easily.

4 Firing end : Broken Ceramics, melted electrodes, deposits



Broken Ceramics



Melted Electrodes



Deposits

When the firing end of the plug has overheated, the ceramics may break or the electrodes may melt.

Under usual engine condition, the plug does not overheat. Note, however, that it gets extremely hot in the case of abnormal combustion (ex. high - speed knocking, pre - ignition).

When the A - F setting is lean due to a faulty fuel system, the combustion temperature may rise, resulting in abnormal combustion. The engines cooling system may be faulty. When the spark timing is too early, the combustion temperature may rise, resulting in abnormal combustion. When deposits (generating from combustion) are accumulated in the combustion chamber, the combustion temperature may rise, resulting in abnormal combustion.

When deposits have accumulated on the firing end of the plug, deposits may overheat, causing abnormal combustion. Especially in a two - cycle engine, oil gets burned and remains in the combustion chamber as deposits, accumulating on the plug as well. It is necessary to remove these deposits periodically.

In engines that consume larger amounts of oil, oil may enter the combustion chamber. It is necessary to check the amount of deposits during inspection of the plug. Burning of oil can also be detected by visible white exhaust gas emitted from the tail pipe.

5 Dry and wet fouling



Majority of faulty plugs fall into this category.

Dry fouling refers to the accumulation of carbon on the firing end of the plug which decreases the insulation and finally leads to miss-fire. Wet fouling refers to the black and shiny state of the firing end covered with carbon and fuel which decreases the insulation causing the engine to mis-fire

Dry fouling



The fuel setting (A/F ratio) is rich.

Faulty auto choke or dirty air cleaner elements.

Idling for a long time.

The spark timing is too late.

The heat range of the plug is too cold.

Wet fouling

6 Insulator : Breakage at the corrugation and caulked portion



Corrugation



Caulked portion

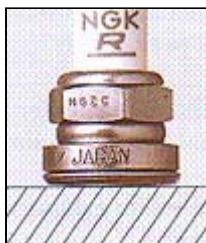
When removing or installing the plug, the plug wrench may slip or be tilted and may hit the corrugation of the plug against the inside, breaking the insulator.

Depending on the type of plug wrench, the plug may break at the caulked portion of

the metal shell. This may not be noticeable from the outside appearance.

Slipped wrench leaves a mark on the hexagonal portion of the metal shell. A plug wrench with a definite hexagonal shape should be used. A rounded or loose wrench should be either avoided or used with special care.

7 : Gasket too loose, too tight



Too loose



Too tight

When the plug has not been tightened enough, the combustion gas leaks out the thread portion. This reduces the radiation of the plug, causing the metal shell to be heated, resulting in discolouration of the metal shell plating. If the metal shell continues to overheat the plug temperature may rise and abnormal combustion may result.

When the plug has been tightened too much the thread neck portion of the metal shell will be lengthened. When the threaded neck portion is lengthened, the insulator and metal will not seal tight enough, causing the combustion gas to leak. When the gas continues to leak, the plug will be overheated and abnormal combustion may result.

The plug should be tightened to the following recommended torques and turning angles.

Plug Thread Diam.	Torque Wrench used	Torque Wrench not used
	Aluminum Head	Aluminum Head
18mm	3.5 ~ 4.5 kgm	After the gasket touches the cylinder head, tighten further 1/2 to 2/3 of a turn (180 - 240 deg.).
14mm	2.5 ~ 3.0 kgm	
12mm	1.5 ~ 1.0 kgm	
10mm	1.0 ~ 1.2 kgm	

8 Breakage at the thread neck



Broken thread

When the plug is tightened too much the metal shell thread neck may be broken at around the first to second thread.

The plugs with smaller diameter portions, the D (12 mm) or C (10 mm) types thread neck portion is not very strong. Observe the recommended torque and turning angle and tighten with special care.