Make a selection:

Overview FAQ Installation Instructions

Tech Info » Spark Plug FAQ

Q: How often should I replace my spark plugs?

A: Unfortunately,there is no single answer to this question. As spark plugs grow older, they lose their sharp edges as material from the center and ground electrodes is slowly eroded away. As the gap between these two points grows, the voltage required to bridge the gap increases proportionately. Even the best ignition systems will be strained to supply enough voltage to completely burn the fuel. It is at this point, when fuel is being left unburned, that the time has come to change spark plugs.

Replacing worn out spark plugs with new ones (with sharp new edges) effectively restores the ignition system's efficiency. Misfires are reduced, power is restored, economy of operation is enhanced and emissions are reduced.

The best guide is the manufacturer's recommendation for your vehicle, as this particular service varies from brand to brand and model to model. In the absence of this information or in conjunction with it, you can rely on the advice of a mechanic who is familiar with your type of vehicle. In the best of all worlds, this would be a mechanic who is also familiar with the vehicle you own. If you find a good mechanic, whether dealer or independent, stick with him. The better he knows your personal vehicle, the better he will be able to diagnose and service it. The end result is very much like a doctor-patient relationship and, in the long run, you will have a healthier vehicle.

Q: How do I choose the right spark plug?

A: There are several factors - such as thread reach, thread diameter, the insulator nose projection and whether the spark plug incorporates a gasket or is of the conical type - to consider when choosing the correct spark plug for your needs. If you have a stock factory vehicle, just click here to use the Part Finder and follow the prompts to find the appropriate plug for your needs. You can also ask specific questions here.

In most cases, it is not until the engine is modified, or the compression is raised significantly, that stock ignition systems and spark plugs begin to show signs of being inadequate. At this point, a variety of factors determine which spark plug will be best suited for a particular configuration. In these modified engines, specific electrode/tip combinations, electrode materials and colder heat ranges can provide measurable gains in power. If your vehicle has had extensive modifications, it would be best to seek the advice of the manufacturer of your vehicle, the aftermarket supplier who manufactured your modifications, or your mechanic.

Q: How do I "read" a spark plug?

A: Being able to "read" a spark plug can be a valuable tuning aid. By examining the insulator firing nose color, an experienced engine tuner can determine a great deal about the engine's overall operating condition.

In general, a light tan/gray color tells you that the spark plug is operating at optimum temperature and that the engine is in good condition. Dark coloring, such as heavy black wet or dry deposits can indicate an overly-rich condition, too cold a heat range spark plug, a possible vacuum leak, low compression, overly retarded timing or too large a plug gap.

If the deposits are wet, it can be an indication of a breached head gasket, poor oil control from ring or valvetrain problems or an extremely rich condition - depending on the nature of the liquid present at the firing tip.

Signs of fouling or excessive heat must be traced quickly to prevent further deterioration of performance and possible engine damage.

Examples of common problems that effect the firing nose of the plug:

	**Normal Condition** An engine's condition can be judged by the appearance of the spark plug's firing end. If the firing end of a spark plug is brown or light gray, the condition can be judged to be good and the spark plug is functioning optimally.
	**Dry and Wet Fouling** Although there are many different cases, if the insulation resistance between the center electrode and the shell is over 10 ohms, the engine can be started normally. If the insulation resistance drops to 0 ohms, the firing end is fouled by either wet or dry carbon.
	**Overheating** When a spark plug overheats, deposits that have accumulated on the insulator tip melt and give the insulator tip a glazed or glossy appearance.
	**Deposits** The accumulation of deposits on the firing end is influenced by oil leakage, fuel quality and the engine's operating duration.
	**Lead Fouling** Lead fouling usually appears as yellowish brown deposits on the insulator nose. This can not be detected by a resitsance tester at room temperature. Lead compounds combine at different temperatures. Those formed at 370-470°C (700-790°F) having the greatest influence on lead resistance.

	**Breakage** Breakage is usually caused by thermal expansion and thermal shock due to sudden heating or cooling.
	**Normal Life** A worn spark plug not only wastes fuel but also strains the whole ignition system because the expanded gap (due to erosion) requires higher voltages. Normal rates of gap growth are as follows: *Four Stroke Engines:* 0.01~0.02 mm/1,000 km (0.00063~0.000126 inches/1,000 miles) *Two Stroke Engines:* 0.02~0.04 mm/1,000 km (0.000126~0.00252 inches/1,000 miles)
	**Abnormal Erosion** Abnormal electrode erosion is caused by the effects of corrosion, oxidation and reaction with lead - all resulting in abnormal gap growth.
	**Melting** Melting is caused by overheating. Mostly, the electrode surface is rather lustrous and uneven. The melting point of nickel alloy is 1,200~1,300°C (2,200~2,400°F).
	**Erosion, Corrosion and Oxidation** The material of the electrodes has oxidized, and when the oxidation is heavy it will be green on the surface. The surface of the electrodes are also fretted and rough.
	**Lead Erosion** Lead erosion is caused by lead compounds in the gasoline which react chemically with the material of the electrodes (nickel alloy) as high temperatures; crystal of nickel alloy fall off because of the lead compounds permeating and seperating the grain boundary of the nickel alloy. Typical lead erosion causes the surface of the ground electrode to become thinner, and the tip of the electrode looks as if it has been chipped.

Q: How much of a performance improvement can I expect from changing plugs?

A: A common misconception is that changing spark plugs will result in a large power increase. In most cases, removing even seriously worn out spark plugs will only result in very modest power gains, typically about 1-2% of total engine output. This could be even less for

computer-controlled vehicles, primarily because most newer vehicles have more powerful ignition systems and the vehicle's computer can make adjustments so that vehicle operation seems smoother and more seamless.

Many people think that simply supplying more spark to the firing tip can and will combust more fuel. What they don't understand is that most newer cars' engines are so efficient that they are already burning all of the available fuel. Simply adding more spark voltage can't burn more fuel because there is no more fuel to burn.

When a stock or near-stock engine is given a fresh set of spark plugs, peak efficiency is restored. The power gains that come from this restored state of tune are usually minimal. Any company that tells you that their spark plug will provide significant gains in power in a stock or near-stock engine is making blanket statements that may not be supportable.

Q: What is a "fouled" spark plug?

A: A spark plug is considered fouled when the insulator nose at the firing tip becomes coated with a foreign substance such as fuel, oil or carbon. This coating makes it easier for the voltage to follow along the insulator nose, leach back down into the metal shell and ground out rather than bridging the gap and firing normally.

Many factors can contribute to spark plug fouling. The air/fuel ratio may be too rich as a result of incorrect carburetor adjustment or a poorly performing fuel injection system. Worn piston rings or valve seals may allow too much oil to leak into the combustion chamber, leading to oil fouling. The ignition system may not be performing properly. Prolonged idling or continuous low-speed driving may keep the spark plug from reaching its optimum operating temperature. Using too cold a spark plug can lead to the same problem. Finally, a dirty air cleaner can create a too-rich condition which can lead to fouling.

Fuel, oil and carbon fouling can all be the result of different causes but, once a spark plug is fouled, it will not provide adequate voltage to the firing tip and that cylinder will not fire properly. In many cases, the spark plug cannot be cleaned sufficiently to restore normal operation. Therefore, it is recommended that a plug be replaced once it is fouled.

Q: Do I need to set the "gap" when installing a new set of plugs?

A: Maybe. A spark plug part number might fit hundreds of engines and, although the factory will typically set the gap to a pre-selected setting, this may not be the right gap for your particular engine. Insufficient spark plug gap can cause pre-ignition, detonation and even engine damage. Too much gap can result in a higher rate of misfires, loss of power, plug fouling and poor fuel economy. It is always best to check the gap against the manufacturer's specifications.

Another consideration that should be taken into account is the extent of any modifications that you may have made to the engine. As an example, when you raise compression or add forced induction (a turbo system, nitrous or supercharger kit) you must reduce the gap (about .004" for every 50 hp you add). However, when you add a high power ignition system (such as those offered by MSD, Crane, Nology) you can open the gap from .002-.005".

If you have any questions, please contact the NGK Sparkplugs Tech Staff here. The manufacturer of your vehicle, the company that produced the aftermarket products you've used and/or your mechanic are all additional sources of gapping information if you've modified your vehicle.

Q: Are special plugs always necessary on a modified engine?

A: It depends on the modifications. The term "modified" refers to those engines that have received bolt-on improvements that may or may not raise the engine's total compression ratio. These can include turbocharging, supercharging, nitrous oxide injection, the use of smaller-chambered cylinder heads, modified piston configurations, free-flowing cylinder heads, change of induction components and/or the use of different fuel types and octane. These kinds of modifications generally require a change from stock spark plugs.

Modifications that will typically not require specialized plugs (in most cases the factory installed plug will be more than adequate) include adding a free-flowing air filter, headers, mufflers and rear-end gears. Basically, any modification that does not alter the overall compression ratio will not usually necessitate changing plug types or heat ranges. Such minor modifications will not significantly increase the amount of heat in the combustion chamber, hence, a plug change is probably not warranted.

However, when compression is raised, along with the added power comes added heat. Since spark plugs must remove heat and a modified engine makes more heat, the spark plug must remove more heat. A colder heat range spark plug must be selected and plug gaps should be adjusted smaller to ensure proper ignitability in this denser air/fuel mixture.

Typically, for every 75-100 hp you add, you should go one step colder on the spark plug's heat range. A hotter heat range is not usually recommended except when severe oil or fuel fouling is occurring.

Submit any questions you may have regarding special modifications or fuel usage here.

Q: How do I install spark plugs correctly?

A: It is essential to tighten a spark plug to the specified turning angle or torque setting. First, screw in the plug finger tight until the gasket meets the cylinder head. Then seat the plug/gasket with a torque or turning angle wrench as specified in the chart below.

Spark Plug Type	Thread Diameter	Cast Iron Cylinder Head (lb-ft.)	Aluminum Clyinder Head (lb-ft.)
Flat seat type (with gasket)	18 ø mm	25.3~32.5	25.3~32.5
	14 ø mm	18.0~25.3	18.0~21.6
	12 ø mm	10.8~18.0	10.8~14.5
	10 ø mm	7.2~10.8	7.2~8.7
	8 ø mm	--	5.8~7.2
Conical seat type (without gasket)	18 ø mm	14.5~21.6	14.5~21.6
Conical seat type (without gasket)	14 ø mm	10.8~18.0	7.2~14.5

This is very important, as excessive tightening of a spark plug can cause breakage of the metal shell and damage to the interior seals. At the same time, insufficient tightening can lead to overheating of the spark plug and potential detonation.

Q: When should I use a resistor spark plug?

A: NGK "R" or resistor spark plugs use a 5k ohm ceramic resistor in the spark plug to suppress ignition noise generated during sparking.

NGK strongly recommends using resistor spark plugs in any vehicle that uses on-board computer systems to monitor or control engine performance. This is because resistor spark plugs reduce electromagnetic interference with on-board electronics.

They are also recommended on any vehicle that has other on-board electronic systems such as engine-management computers, two-way radios, GPS systems, depth finders or whenever recommended by the manufacturer.

In fact, using a non-resistor plug in certain applications can actually cause the engine to suffer undesirable side effects such as an erratic idle, high-rpm misfire, engine run-on, power drop off at certain rpm levels and abnormal combustion.

Q: Why are there different heat ranges?

A: It is a common misconception that spark plugs create heat. They don't. A heat range refers to how much heat a spark plug is capable of removing from the combustion chamber.

Selecting a spark plug with the proper heat range will insure that the tip will maintain a temperature high enough to prevent fouling yet be cool enough to prevent pre-ignition. While there are many things that can cause pre-ignition, selecting a spark plug in the proper heat range will ensure that the spark plug itself is not a hot spot source. More information about heat ranges can be found here.

Q: What do the numbers and letters in a part number represent?

A: The various numbers and letters in a spark plug code or identification number basically identify the features and functions of a particular plug. Included would be information such as plug type, heat rating, construction, thread diameter, thread reach and firing end construction.

Click on the link below to download a guide that will help you decipher the various NGK alpha-numeric combinations. You will need to open it with Adobe Acrobat Reader. If you do not already have Acrobat Reader installed on your computer, we've provided a link to the free download area for your conveniece.

Download the part number guide

Q: Does humidity affect spark plug temperature?

A: Yes, humidity does affect spark plug temperature. As the humidity increases, the intake air mass decreases. This results in lower combustion pressures and temperatures, causing a decrease in the spark plug's temperature.

Q: Does ignition timing affect a spark plug's temperature?

A: Yes, ignition timing directly affects the firing end temperature of the spark plug. Advancing the ignition timing prolongs the time to compress the burning gases. The pre-ignition temperature also elevates gradually, since the pressure and temperature of the combustible mixture is low before ignition. Advancing your timing elevates firing end temperatures.

Q: Does compression ratio affect firing end temperature?

A:Yes, the by-product of increased compression is the elevation in cylinder temperatures. This is why it is recommended to choose a spark plug suitable for your application. NGK Spark Plugs recommends dropping heat ranges and altering Air/Fuel mixtures and timing as needed. It is very important to dissipate the excess heat from the combustion chamber in order to prevent pre-ignition.

Q: Can old spark plugs be cleaned

A: Yes, you can clean spark plugs. However, it is good to remember that spark plugs are a wearable item, so it's important to make sure you check to see if it's worth cleaning before you go through the following steps.

- If the firing end is wet, make sure you clean the spark plug with a quick drying cleaner. (Examples: contact cleaner or brake cleaner).
- Sand blast the spark plug using low air pressure and use a dry compound.
- Completely blow all the sand from the spark plug.
- Using a wire brush clean the threads and re-gap.

NOTE: Insufficient cleaning of the spark plug may lead to spark plug failure in a very short period of time. Clean the spark plug thoroughly to avoid problems later. Remember, if a spark plug is fouling it's usually a result of engine side factors or incorrect heat range selection.

Q: What is the maximum I can open or close the gap?

A: NGK doesn't recommend adjusting the spark plug gap < or > .008". The reason for this is the ground electrode and center electrode won't line up properly, hindering spark plug performance.

Q: What is pre-ignition?

A:Pre-ignition is defined as the ignition of the air/fuel mixture before desired ignition timing.

Q: What is detonation?

A:Detonation is a spark plugs worst enemy. It can break insulators and ground electrodes. Spark plug temperatures can reach in excess of 3000 °F.

Detonation, in simple terms, is a violent uncontrolled burn of the air/fuel mixture, which occurs when excessive heat and cylinder pressure causes the air/fuel mixture to spontaneously ignite.