What Factors Affect Spark-Plug Heat Range?

WRENCHIN' @ RANDOM

By Marlan Davis

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"Heat range" is the relative temperature of the spark plug's core nose. Critical factors involved in choosing the correct heat range include:

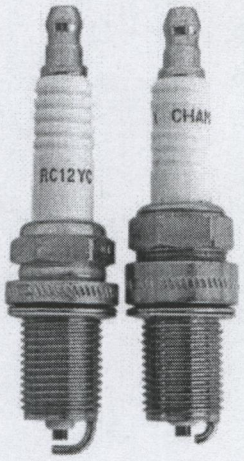
Air/Fuel Mixture: Lean air/fuel ratios raise cylinder-head temperatures, requiring a colder plug. Rich air/fuel ratios require a hotter plug to prevent fouling. Mixtures that cause the plugs to read lean may contribute to preignition or detonation.

Spark Advance: Ignition timing has one of the greatest effects on heat-range selections. Advancing timing raises combustion temperatures, calling for colder plugs.

Compression Ratio: Increasing the mechanical compression ratio raises cylinder pressure, resulting in higher cylinder temperatures. The higher the compression ratio, the colder the spark plug needs to be. According to Champion Spark Plugs, for normally aspirated, gasoline-fueled engines, a good rule of thumb is to go about one heat range colder for each full point in compression ratio increase from 9:1 through about 12.5:1, and two heat ranges colder for each point increase between 12.5:1 and 14.5:1. Beyond 14.5:1, 3–4 heat range reductions per point may be needed.

Gasoline **Quality:** With leaded fuels, the lead is attracted to the hotter (core-nose) part of the plug, causing glazing; running a slightly colder plug helps prevent this. On today's cleaner-burning, oxygenated, unleaded gas, an equivalent engine needs to run about 1–2 heat ranges hotter plug than originally specified (many plug makers have revised their catalogs).

Methanol: Alky-fueled engines need a plug at least one step colder than "normal" for an equivalent gas-fueled motor.



The cold Champion C57HCX racing plug (right) has a shorter insulator tip that helps preven

Nitrous Oxide: N2O raises cylinder temperatures and may require a plug 1–2 heat ranges colder.

Supercharging/Turbocharging: With increased chamber pressure and temperature, two or more heat ranges colder may be needed. Extreme high-boost, race-only apps may need a surface-gap plug.

Sustained Acceleration: Prolonged acceleration or high-speed driving raises temperatures and calls for colder plugs.

Elevation: Leaning the mixture and advancing the timing partially compensates for lost power and efficiency caused by higher elevation. Spark-plug heat ranges should stay the same as at sea level, unless racing above 3,000 feet, where one step hotter usually suffices.

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