

Fault diagnosis at a glance: Correct interpreting of spark plug conditions

Normal condition



Normal condition of a functioning spark plug

Insulator nose from gray-white/gray-yellow to fawn brown color.
Engine is OK. Heat range correctly selected. Mixture setting and ignition timing OK, no misfiring, cold starting device functioning. No residue from fuel additives containing lead or alloying constituents from engine oil. No thermal overload.

Carbon-fouled



Insulator nose, electrodes and spark-plug shell covered with velvet-like dull black soot deposits.

Cause: Incorrect mixture setting (carburetor, injection): Mixture too rich, air cleaner severely fouled, automatic choke not OK or manual choke actuated too long, predominantly short distance driving, spark plug too cold, heat range code number too low.
Effect: Misfiring, poor cold starting performance.
Remedy: Set mixture and starting device correctly, check air cleaner.

Oil-fouled



Insulator nose, electrodes and spark-plug shell covered with shiny soot or carbon deposits.

Cause: Too much oil in combustion chamber. Oil level too high, heavily worn piston rings, cylinders and valve guides. In two-stroke gasoline engines, too much oil in mixture.
Effect: Misfiring, poor starting performance.
Remedy: Overhaul engine, correct fuel/oil mixture, new spark plugs.

Severe center electrode wear



High material abrasion at the center electrode due to wear

Cause: Spark-plug replacement interval not complied with.
Effect: Misfiring, particularly during acceleration (ignition voltage no longer sufficient for large electrode gap). Poor starting performance.
Remedy: New spark plugs.

Heavy lead deposits



In places, thick brownish yellow glaze on insulator nose which may also have a greenish tinge.

Cause: Fuel additives containing lead. Glaze develops under heavy engine load after lengthy part load operation.
Effect: With heavy loading, coating becomes conductive and causes misfiring.
Remedy: New spark plugs, cleaning has no effect.

Ash-fouling



Thick ash coating from oil and fuel additives on insulator nose, in scavenging area (annular orifice) and on ground electrode. Loose to cinder-like structure.

Cause: Alloying constituents, particularly from oil, may deposit such ash in the combustion chamber and on the spark-plug face.
Effect: Can lead to auto-ignition with loss of power and engine damage.
Remedy: Check engine, New spark plugs, possibly use different oil.

Partially melted center electrode



Center electrode partially melted, blistered, spongy, soft insulator nose tip.

Cause: Thermal overload due to auto-ignition, e.g. excessively advanced ignition timing, combustion residue in combustion chamber, defective valves, defective ignition distributor and poor fuel grade. Heat range possibly too low.
Effect: Misfiring, loss of power (engine damage).
Remedy: Check engine, ignition and mixture formation. New spark plugs with correct heat range.

Melted center electrode



Center electrode melted, ground electrode also severely corroded.

Cause: Thermal overload due to auto-ignition, e.g. excessively advanced ignition timing, combustion residue in combustion chamber, defective valves, defective ignition distributor and poor fuel grade.
Effect: Misfiring, loss of power, possibly engine damage. Overheated center electrode may cause insulator nose to crack.
Remedy: Check engine, ignition and mixture formation. New spark plugs.

Melted electrodes



Cauliflower-like appearance of electrodes. Possibly precipitation of material not originating from the spark plug.

Cause: Thermal overload due to auto-ignition, e.g. excessively advanced ignition timing, combustion residues in combustion chamber, defective valves, defective ignition distributor and poor fuel grade.
Effect: Loss of power.
Remedy: Check engine, ignition and mixture formation. New spark plugs.

Ferrocene



Insulator nose, electrodes and part of the spark plug housing coated with red-orange adherent deposits.

Cause: Fuel additive containing iron. The deposits occur after a few thousand kilometers in normal operation.
Effect: The coating containing iron is electrically conductive and causes misfiring.
Remedy: New spark plugs, cleaning has no effect.

Severe ground electrode wear



High material abrasion at the ground electrode due to wear

Cause: Aggressive fuel and oil additives. Unfavorable flow conditions in combustion chamber, possibly due to deposits, engine knocking. No thermal overload.
Effect: Misfiring, particularly during acceleration (ignition voltage no longer sufficient for large electrode gap). Poor starting performance.
Remedy: New spark plugs.

Cracking of insulator nose



Cracking of insulator nose

Cause: Mechanical damage due to impact, dropping or pressure on the center electrode resulting from incorrect handling. In marginal cases – especially after excessively long use – the insulator nose may crack due to deposits between the center electrode and insulator nose, and due to corrosion of the center electrode.
Effect: Misfiring, sparkover at points not reliably supplied with fresh mixture.
Remedy: New spark plugs.