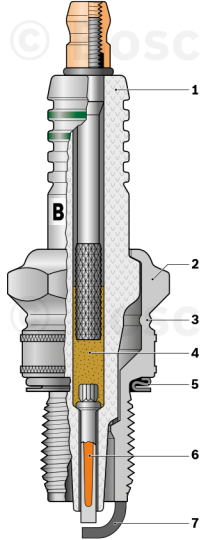


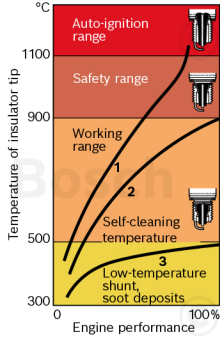
# Bosch Classic Spark Plug

## Spark plug design



- 1 Al<sub>2</sub>O<sub>3</sub> ceramic insulator
- 2 Nickel-plated spark plug shell
- 3 Heat-shrinkage zone
- 4 Conductive glass seal
- 5 Captive gasket
- 6 Compound center electrode (copper and nickel)
- 7 Ground electrode

## Spark-plug temperature response



- 1 Spark plug with excessively high heat-range code number
- 2 Spark plug with suitable heat-range code number
- 3 Spark plug with excessively low heat-range code number

The working range temperature should be from 500 °C to 900 °C for different engine performance ratings.

## Spark plug concepts



### Air gap design

The ignition spark travels along a direct path to the ground electrode and thus ignites the air-fuel mixture.



### Surface gap design

The layout of the ground electrodes is such that only surface air gap sparks, which are particularly long and powerful, can be formed.



### Surface air gap design

This design combines both spark paths. Both air gap sparks and surface air gap sparks ignite the air-fuel mixture.

## Spark plug faces



### Normal condition

Insulator nose with color between whitish or yellowish-grey and russet. Engine OK. Correct heat range. A/F mixture adjustment and timing OK, no ignition miss, cold-start enrichment functioning correctly.  
No residues from lead fuel additives or engine-oil additives.  
No overheating.



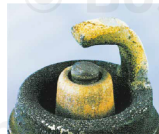
### Soot fouling

Insulator nose, electrodes, and spark plug shell covered with a felt-textured, matt-black coating of soot.  
Cause: Incorrect A/F mixture adjustment. A/F mixture too rich, extremely dirty air filter, automatic choke or manual choke actuated too long, vehicle only used for extremely short distances, spark plug too cold, heat range too low.  
Effects: Ignition miss, poor cold starts.  
Remedy: Adjust A/F mixture and cold-start system, check air filter.



### Oil fouling

Insulator nose, electrodes, and spark plug shell covered with shiny oil layer of soot or carbon.  
Cause: Excessive oil in combustion chamber. Oil level too high, severe wear of piston rings, cylinder walls, or valve seals/guides. Too much oil in fuel mixture (two-stroke engines).  
Effects: Ignition loss. Starting difficulties.  
Remedy: Overhaul engine, use correct A/F mixture, replace spark plugs.



### Severely eroded center electrode

Cause: Failure to observe spark plug replacement intervals.  
Effects: Ignition miss, especially during acceleration (ignition voltage not adequate for bridging wider electrode gap).  
Starting difficulties.  
Remedy: New spark plugs.



### Severe lead deposits

Thick, brownish-yellow glaze, thick in some places, possibly with greenish tint, has formed on the insulator nose.  
Cause: Fuel additives containing lead. The glaze forms when the engine is operated at high loads after extended part throttle operation.  
Effects: At high loads the glaze becomes electrically conductive, leading to ignition miss.  
Remedy: New spark plugs, cleaning them is pointless.



### Ash formation

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: Repair engine. Use new spark plugs and possibly different oil.



### Center electrode partially melted

Center electrode partially melted, blistered, spongy 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.



### Center electrode melted away

Center electrode melted away and ground electrode severely corroded.  
Cause: Thermal overload due to auto-ignition, e.g. on account of excessively advanced ignition timing.  
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.



### Partially melted electrodes

Cauliflower-like appearance of electrodes. Possibly deposition of foreign matter.  
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: Loss of power prior to total failure (engine damage).  
Remedy: Check engine, ignition and mixture formation. New spark plugs.



### Ferrocen

Firmly adhering reddish orange deposits coat the insulator nose, electrodes and to some extent the spark plug shell.  
Cause: Fuel additives containing iron. Deposits occur in normal operation after a few thousand kilometers.  
Effect: The iron in the coating is electrically conductive and causes misfiring.  
Remedy: New spark plugs, cleaning has no effect.



### Ground electrode wear

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



### Cracking of insulator nose

Cause: Mechanical damage due to inexpert handling. In borderline cases – particularly following excessive operating time – cracking of insulator nose may be caused by deposits between center electrode and insulator nose and by corrosion of center electrode.  
Effect: Misfiring, sparkover at points not reliably supplied with fresh mixture.  
Remedy: New spark plugs.