## Volkswagen Cabriolet
### DIY Guide: Spark Plugs

#### Cars

**1980: all, except California emissions**

<table>
<thead>
<tr>
<th>Electrode</th>
<th>Type</th>
<th>Original Bosch</th>
<th>NGK</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single, copper</td>
<td>Resistor</td>
<td>WR7DS</td>
<td>BPR5ES (#7734)</td>
<td></td>
</tr>
<tr>
<td>Single, platinum</td>
<td>Resistor</td>
<td>WR7DS</td>
<td>BPR5EGP (#7082)</td>
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</tr>
</tbody>
</table>

**1980: California emissions; 1981-1993: all**

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<tr>
<td>Single, silver</td>
<td>Resistor</td>
<td>WR7DS</td>
<td>BPR6EY BL1 (#2489)</td>
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<tr>
<td>Single, copper</td>
<td>Resistor</td>
<td>WR7DC</td>
<td>BPR6ES (#7131)</td>
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<tr>
<td>Single, platinum</td>
<td>Resistor</td>
<td>WR7DP</td>
<td>BPR6EGP (#7084)</td>
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<tr>
<td>Single, copper</td>
<td>Non-resistor</td>
<td>W7DC</td>
<td>BP6ES (#7333)</td>
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<tr>
<td>Triple, platinum</td>
<td>Non-resistor</td>
<td>W7DTC</td>
<td>BP6ET (#1263)</td>
<td>Recommended for Digifant</td>
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</tbody>
</table>

#### Volkswagen Parts Catalog ~ Complete Current Spark Plug Listings

<table>
<thead>
<tr>
<th>VW Part No.</th>
<th>Plug</th>
<th>Equivalent</th>
<th>Engines</th>
</tr>
</thead>
<tbody>
<tr>
<td>101000005AD</td>
<td>Bosch W8DTC</td>
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<td>EW, HN</td>
</tr>
<tr>
<td>101000027AC</td>
<td>NGK BP5ET-10</td>
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<td>EW, HN</td>
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<tr>
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<td>Beru Z2 14-8DTU</td>
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<tr>
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<td>Champion N9BYC</td>
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<td>EW, HN</td>
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<tr>
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<td>Beru Z61 14-7DUO</td>
<td>Beru Z11 14-7DU</td>
<td>EG, EN, HK</td>
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<tr>
<td>N01781139</td>
<td>Bosch W7DC</td>
<td>Beru Z11 14-7DU</td>
<td>EN</td>
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<tr>
<td>10100005AB</td>
<td>Bosch W7DTC</td>
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<td>EX, DX, KT, 2H</td>
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<tr>
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<tr>
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<td>Beru Z75 14-G-8DTU</td>
<td>2H</td>
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<tr>
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<td>EG, DX, JJ</td>
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<tr>
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<td>Bosch W5DCO</td>
<td>Beru Z42 14-5DU</td>
<td>DX, JJ</td>
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<tr>
<td>101000036AA</td>
<td>NGK BUR5ET</td>
<td>Beru Z91 14-GH-7DTUR</td>
<td>JH</td>
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<tr>
<td>101000036AC</td>
<td>NGK BUR5ET-10</td>
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<td>RE</td>
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<tr>
<td>101000040AE</td>
<td>Beru Z93 14-GH-8DTURX</td>
<td></td>
<td>RE</td>
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<tr>
<td>N01781139</td>
<td>?</td>
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<td>EJ, EM, FA, FN, FV, GG, GH, HN, JB</td>
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<tr>
<td>10100002AB</td>
<td>Beru Z61 14-7DUO</td>
<td></td>
<td>EJ, EM, FA, FN, FV, GG, GH, HN, JB</td>
</tr>
</tbody>
</table>

### Which plugs to use?

- Copper or platinum; iridium plugs are a waste of money for these cars.
- Single or triple? Resistor or non-resistor? All four types were supplied by VW for these cars. Use the plugs that work best with your particular car.
- Brand: NGK is recommended over all others.
- You may come across some folks online telling you to use BP6ET and nothing else, and that resistor plugs are useless. While BP6ET is the best for Digifant (and recommended by VW as seen in the table above), CIS doesn't rightly care, but VW recommends resistor plugs. Again, plugs are trial and error components; use what works best for your car. For example: I pulled single, copper resistor plugs out of my '86 CIS, installed the much-ballyhooed W7DTC plugs (back when Bosch was still making decent plugs), and it ran like crap. Replaced the W7DTC's with NGK BPR6ES plugs and it was back to running like new, and that's without making any other adjustments.
**Spark plug gap:** 0.028”/0.7mm. Plugs come pre-gapped; however, it is good practice to check all new plugs with a plug gapping tool like those shown below.

![Spark plug gapping tool](image)

**Spark plug terminal:**

<table>
<thead>
<tr>
<th>These cars use plugs with a threaded terminal. If your new plugs come with a terminal nut installed, unscrew it and throw it away.</th>
<th>NGK plugs differentiate between removable nuts and non-removable by color:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Spark plug terminal" /></td>
<td><img src="image" alt="NGK plug terminals" /></td>
</tr>
</tbody>
</table>

**Firing order:** 1-3-4-2

![Firing order](image)

Plug wires on distributor cap may vary from the image above; the #1 plug wire should be in the same position as the rotor tip.
NGK numbering system:

**Thread Diameter**
- A: 18 mm
- B: 14 mm
- C: 10 mm
- D: 12 mm
- J: 12 mm

**Thread Reach**
- E: 19 mm (3/4"
- EF: Tapered Seat 17.5 mm (.70"
- FS: Tapered Seat 10.9 mm (.43"
- H: 12.7 mm (1/2"
- EH: Partial thread 19 mm (3/4"
- L: 11.2 mm (7/16"
- S: 9.5 mm (3/8"
- Z: 21 mm
- NO SYMBOL: 18mme = 12 mm Reach
- 14mme = 9.5 mm (3/8"

**Concentration (ONE OR MORE LETTERS MAY BE COMBINED)**
- C: Hex Size 5/8
- K: Hex Size 5/8
- M: Compact Type
- P: Projected Insulator Type
- R: Resistor Type
- U: Surface or Semi
- Surface Discharge Type
- Z: Inductive Resistor

**Firing End Construction**
- A: Special Design
- B: Special Design
- C: Low Angle Ground Electrode
- CM: Compact type, low angle ground electrode
- E: V-Grooved center electrode (14mm only)
- ES: Standard 3/4" Thread Reach (2.5mm) center electrode
- F: Tapered Seat
- G: Fine wire nickel alloy center electrode
- G: Copper core ground electrode
- GV: Gold-palladium center electrode
- K: 2-Ground electrodes
- L: Half heat range, (See spec. chart)
- LM: Compact type for Lawn Mower
- M: 2-Ground electrodes For Mazda Rotary Eng.
- N: Special Side electrode
- P: Premium Platinum
- Q: 4-Ground electrode
- R: Special Ground electrode
- S: Standard 2.5mm center electrode
- T: 3-Ground electrode
- U: Semi-surface discharge
- V: Fine wire gold-palladium center electrode
- VX: High performance platinum
- W: Tungsten electrode
- X: Booster gap
- Y: V-Grooved center electrode (14mm only)
- Z: 2.5mm Insulator
- Z: Thick 2.9mm center electrode

**Plug Type**
- I: Iridium Platinum
- L: Thread Reach 26.5mm
- P*: Premium Platinum
- Z*: Extended Gap

**Heat Rating Numbers**
- 2 Hot
- 11 Cold

**Firing End Construction**
- A, B, C: Special Design

**Metal Shell Size**
- F: ø 14, 19mm (3/4"
- G: ø 14, 19mm (3/4"
- J: ø 12, 19mm (3/4"
- M: ø 10, 19mm (3/4"
- T: ø 14, 17.5mm Reach, 16mm (5/8"
- PTR5A-13: ø 14, 25mm Reach, 16mm (5/8"

**Construction**
- R: Resistor
## Diagnostics

### Normal
- **Using Unleaded Petrol**
- **Using Lead Replacement Petrol**

### Symptoms
- Hard starting
- Misfiring
- Black exhaust smoke

### Causes
- Rich mixture
- Retarded ignition
- Low compression
- Too cold spark plug

### Remedy
- Check float level
- Check choke
- Check ignition timing
- Check air cleaner
- Check compression
- Replace spark plug with correct heat range

### Oil Fouled
- Hard starting
- Misfiring
- Grey / white exhaust smoke
- Loss of oil

### Causes
- Worn rings
- Worn piston
- Leaking valve stem seals
- Over-filled oil sump

### Remedy
- Replace worn components
- Replace spark plug with correct heat range

### Overheated
- “Pinking” under acceleration or climbing hills
- Engine run-on after switching off

### Causes
- Lean mixture
- Advanced ignition timing
- Too hot spark plug

### Remedy
- Check jets are not clogged
- Check float level
- Check ignition timing
- Replace spark plug with correct heat range

### Damaged
- Misfiring
- Loss of power
- Hard starting
- Noise in engine

### Causes
- Foreign particles inside cylinder
- Broken or damaged valve

### Remedy
- Replace spark plugs
- Remove foreign or damaged components

### Under Tightened
- Melted spark plug
- Damaged piston crown
- Damage to cylinder head

### Causes
- Spark plug incorrectly threaded
- Spark plug only hand tightened
- Dirt or carbon in threads of cylinder head

### Remedy
- Replace spark plugs
- Tighten spark plug to correct torque
- Replace damaged components
- Check compression on all cylinders

### Worn
- Hard starting
- Reduced fuel economy

### Causes
- Normal electrode wear
- $+0.03 \text{ mm} / 1,000 \text{ km}$
- Fuel deposits (carbon, lead, additives & salts)

### Remedy
- Replace spark plug with correct heat range

### Corona Stain
- Redish brown stain above metal shell on insulator

### Causes
- Oil particles suspended in the air adhere to the insulator due to high voltage

### Remedy
- No deterioration to the function of the spark plug
- Change spark plug ONLY at recommended service intervals
**Normal**

Combustion deposits are slight and not heavy enough to cause any detrimental effect on engine performance. Note the brown to grayish tan color, and minimal amount of electrode erosion which clearly indicates the plug is in the correct heat range and has been operating in a "healthy" engine.

**Mechanical Damage**

May be caused by a foreign object that has accidentally entered the combustion chamber. When this condition is discovered, check the other cylinders to prevent a recurrence. Since it is possible for a small object to "travel" from one cylinder to another where a large degree of valve overlap exists. This condition may also be due to improper reach spark plugs that permit the piston to touch or collide with the firing end.

**Oil Fouled**

Too much oil is entering the combustion chamber. This is often caused by piston rings or cylinder walls that are badly worn. Oil may also be pulled into the chamber because of excessive clearance in the valve stem guides. If the PCV valve is plugged or inoperative it can cause a build-up of crankcase pressure which can force oil and oil vapors past the rings and valve guides into the combustion chamber.

**Overheated**

A clean, white insulator firing tip and/or excessive electrode erosion indicates this spark plug condition. It is often caused by over advanced ignition timing, poor engine cooling system efficiency (scale, stoppages, low level), a very lean air-fuel mixture, or a leaking intake manifold. When these conditions prevail, even a plug of the correct heat range will overheat.

**Insulator Glazing**

Glazing appears as a yellowish, varnish-like color. This condition indicates that spark plug temperatures have risen suddenly during a hard, fast acceleration period. As a result, normal combustion deposits do not have an opportunity to "furnish" as they normally do. Instead, they melt to form a conductive coating and misfire will occur.

**Pre-Ignition**

A sign of ignition that occurs before the spark plug fires. This usually occurs when the coil is hot and under a high load.

**Gap Bridging**

Rarely occurs in automotive engines; however, this condition is caused by similar conditions that produce spark failure. Definition of correct heat range is a guide to bridge the gap when the engine is suddenly put under a heavy load.

**Splash Fouled**

Appearance of "spotted" deposits on the firing tip of the insulator and often occurs after a long period of time. By-products of combustion may loosen suddenly when normal combustion temperatures are restored. During hard acceleration these materials shed from the piston crown or valve heads, and are thrown against the hot insulator surface.

**Detonation**

This form of abnormal combustion has fractured the insulator core nose of the plug. The explosion that occurs in this situation applies extreme pressures on internal engine components. Prime causes include ignition time advanced too far, lean air-fuel mixtures, and insufficient octane rating of the gasoline.

**Ash Fouled**

A build-up of combustion deposits stemming primarily from the burning of oil and/or fuel additives during normal combustion ... normally non-conductive. When heavier deposits are allowed to accumulate over a longer mileage period, they can "mask" the spark, resulting in a plug misfire condition.

**Carbon Fouled**

Soft, black, sooty deposits easily identify this plug condition. This is most often caused by an over-rich, air-fuel mixture. Check for a sticking choke, clogged air cleaner, or a carburetor problem — fuel level high, defective needle or seat, etc. This may also be attributed to weak ignition voltage, an inoperative preheating system (carburetor intake air), or extremely low cylinder compression.

**Worn**

This plug has served its useful life and should be replaced. The voltage required to fire the plug has approximately doubled and will continue to increase with additional miles of travel. Even higher voltage requirements, as much as 100% above normal, may occur when the engine is quickly accelerated. Poor engine performance and a less in fuel economy are traits of a worn spark.

*Source: Champion Spark Plugs*