

Pioneers of copper core spark plugs and still the leaders in spark plug technology.



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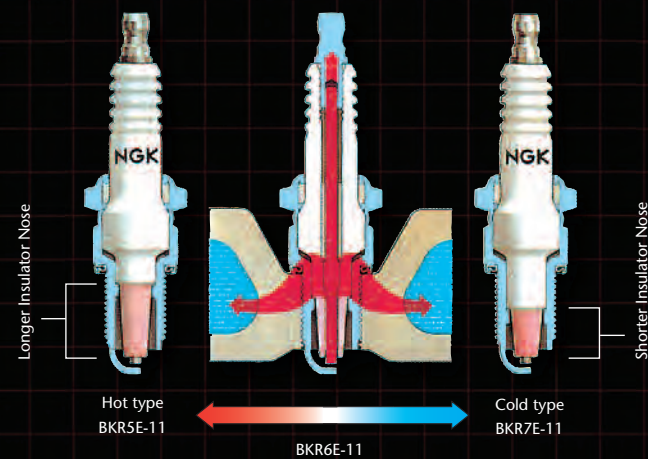
Understanding heat range & heat dissipation

Spark plugs do not generate heat. They make good use of the heat produced by combustion to elevate the temperature of the insulator nose, keeping it free of carbon deposits. The optimum temperature range of the firing end is shown in the chart opposite. As conditions vary considerably from engine to engine a spark plug must be selected that can get up to temperature quickly but not become overheated under high loads. The 'heat range' of a spark plug is a measure of its ability to dissipate, thereby controlling this heat energy. Most of this energy is transferred from the combustion chamber to the cylinder head via the threaded portion and gasket/seating area.

We need to keep the temperature at the firing end of the spark plug within a certain region to prevent problems. Engine types differ enormously in their performance characteristics therefore we need to choose a plug with a suitable 'heat range' to match the engine and its intended use.

This complex selection process is carried out by NGK engineers working with the vehicle manufacturer.

Heat rating and heat flow path of spark plugs



Checking the firing end appearance

Firing end temperature °C			Overheating The insulator is white and sometimes blistered. If the insulator temperature is over 870°C pre-ignition may occur. Engine power will be reduced and the piston may be damaged.	Causes <ul style="list-style-type: none">Over advanced ignition timingToo lean a fuel mixtureBlocked injectorsInsufficient coolingExcessive deposits in the combustion chamber
Overheating area			Good condition The insulator is brown or light grey.	Even if the spark plug is used under good conditions, deposits will accumulate. Regular inspection and replacement is advisable.
Optimum temperature area			450°	
Fouling area			Idle Temp { 250° 150°	Fouling Carbon accumulates on the insulator nose forming a leakage path to earth. The engine misfires resulting in bad starting and poor acceleration. Particularly common with unleaded fuel.
				Causes <ul style="list-style-type: none">Too rich a fuel mixtureExcessive use of chokeProlonged slow speed driving or idlingBlocked air filterSpark plug heat range too cold

Torque tightening chart

FOR FLAT SEAT TYPE (WITH GASKET)					TAPER SEAT TYPE	
Thread Ø	18mm	14mm	12mm	10mm	8mm	
Cast iron head	35-45Nm (3.5-4.5kgm) (25.3-32.5lbs ft)	25-35Nm (2.5-3.5kgm) (18.0-25.3lbs ft)	15-25Nm (1.5-2.5kgm) (10.8-18.0lbs ft)	10-15Nm (1.0-1.5kgm) (7.2-10.8lbs ft)		20-30Nm (2.0-3.0kgm) (14.5-21.6lbs ft)
Aluminium head	35-40Nm (3.5-4.0kgm) (25.3-28.9lbs ft)	25-30Nm (2.5-3.0kgm) (18.0-21.6lbs ft)	15-20Nm (1.5-2.0kgm) (10.8-14.5lbs ft)	10-12Nm (1.0-1.2kgm) (7.2-8.7lbs ft)	8-10Nm (0.8-1.0kgm) (5.8-7.2lbs ft)	15-25Nm (1.5-2.5kgm) (10.8-18.0lbs ft)

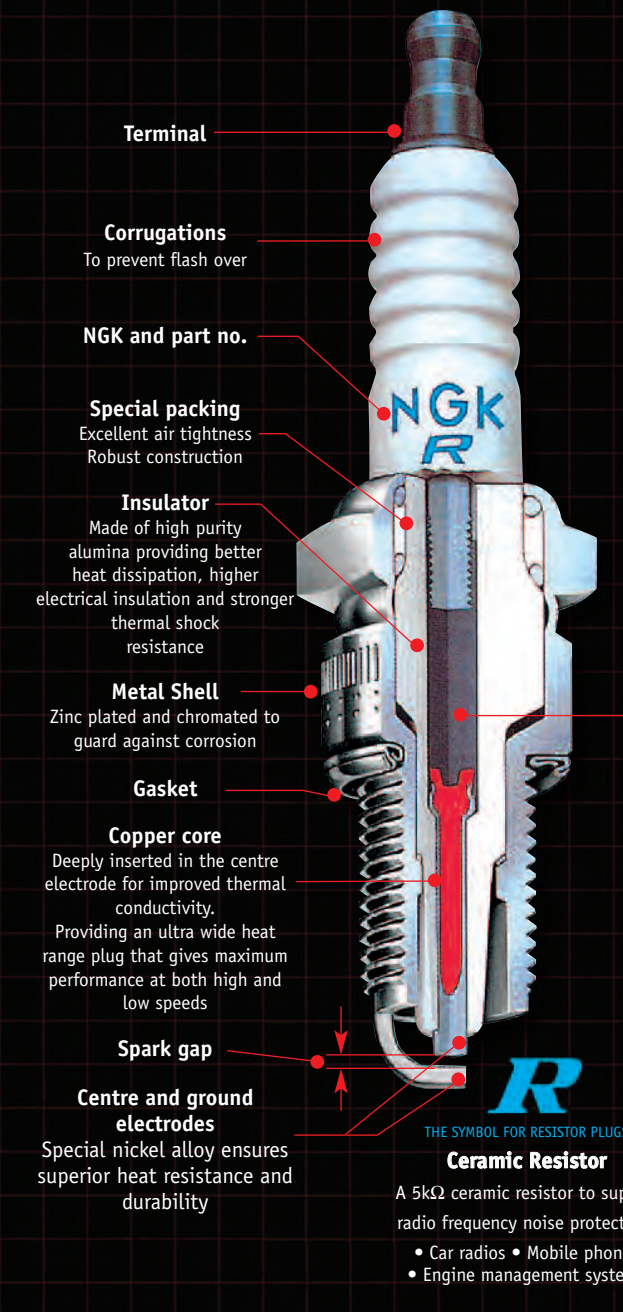
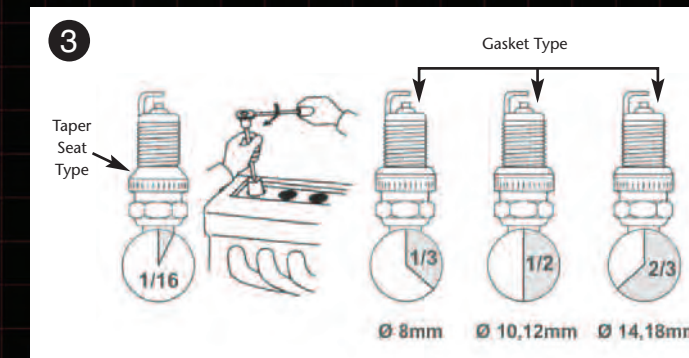
Recommended installation procedure

Spark plugs must be secured to the correct tightening torque. A plug left too loose may overheat and suffer vibration damage. One that is too tight may suffer from shell distortion, cracking of the insulator or shell separation upon subsequent renewal.

Refer to current NGK catalogue for correct spark plug selection.

- Check condition and cleanliness of threads in cylinder head
- Ensure plug is gapped according to vehicle manufacturers specification
- Install new spark plug by hand until it seats. A length of rubber tubing pushed over the insulator can be a useful aid for plug installation where access is difficult
- Tighten to specified torque setting as shown in the Torque tightening chart.
- If torque wrench is unavailable fig.3 below will serve as an angular guide for tightening new spark plugs
- Reused gasket type spark plugs require only 1/12 turn
- Always use the correct tools for removal/installation to prevent damage to the spark plug or engine

Inspect spark plug cover and renew if necessary

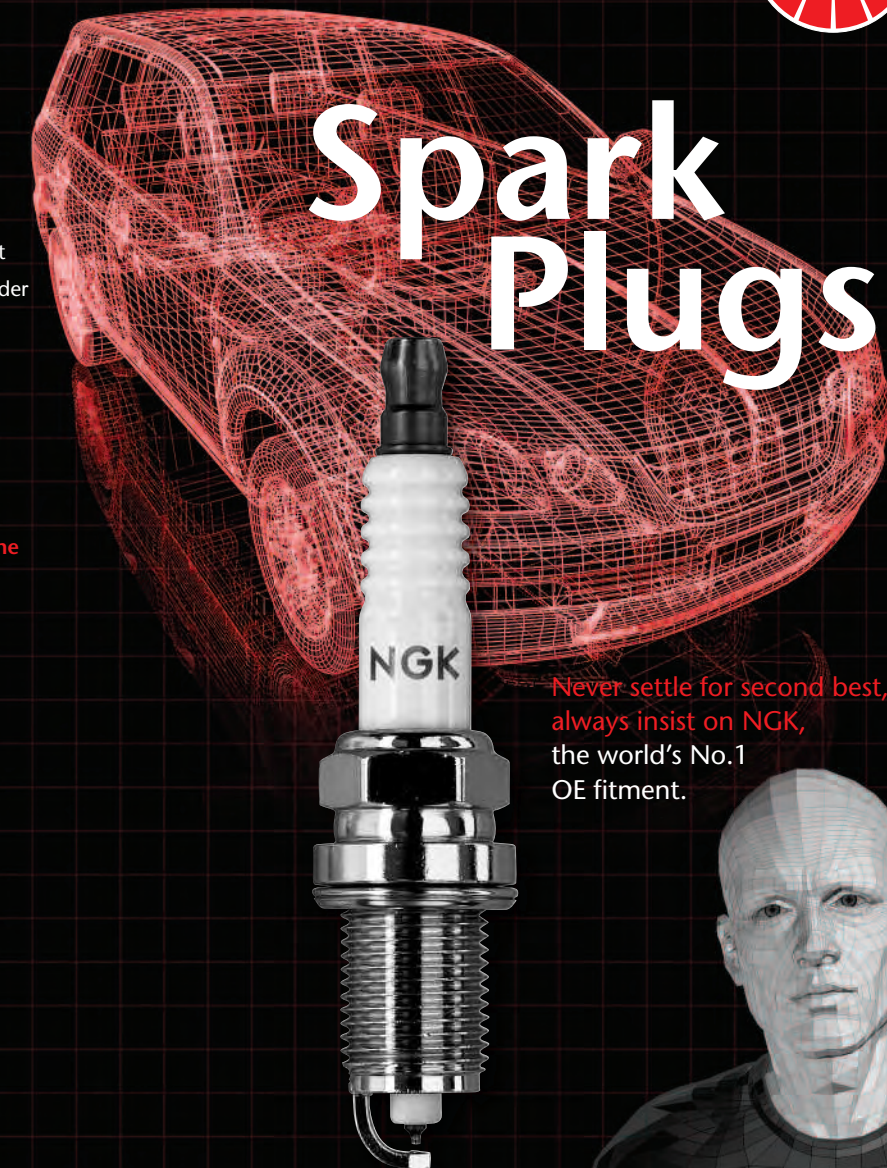


How to get the perfect match for your engine

NGK work closely with engine manufacturers the world over to develop spark plugs optimised for their specific engines. To ensure you get the perfect match for your application please consult an NGK Spark plug catalogue or use the part finder facility on our website at www.ngkntk.co.uk.

If you require further assistance, please contact NGK Technical Services Department.

It is essential to use the correct spark plug to optimise performance and economy. Use of the wrong spark plug could damage your engine.



Never settle for second best, always insist on NGK, the world's No.1 OE fitment.

THE WORLD'S NO.1 OE FITMENT SPARK PLUG

Alfa Romeo Aston Martin Audi Bentley BMW Caterham Cars Chevrolet Citroen Daewoo Daihatsu DaimlerChrysler Ferrari Fiat Ford General Motors Honda Hyundai Isuzu Jaguar Jeep Kia Lancia Land Rover Lexus Lotus Maserati Mazda Mercedes Mini Mitsubishi Nissan Perodua Peugeot Proton Renault Rolls-Royce Saab Seat Skoda Smart Suzuki Subaru Toyota Vauxhall Volvo VW

Technical Perfection from the people who know. NGK

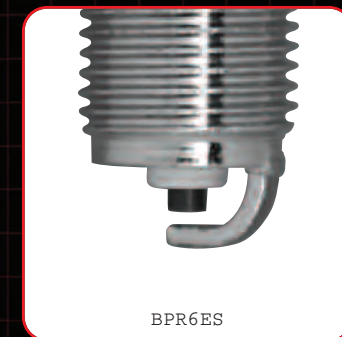


NGK. The world's No.1 spark plug is the perfect match for every engine.

Standard

e.g. BKR6ES
BPR6ES

Parallel face nickel alloy electrodes
typical centre electrode diameter
2.5mm, gap setting 0.7-0.8mm



Multi Electrode

e.g. BKR6EKC
DCPR8EKC
CR9EK

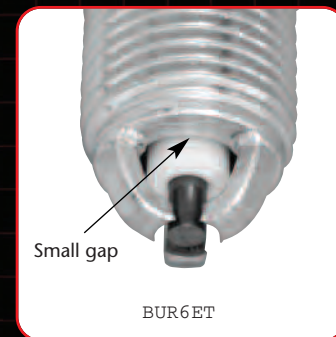
Two ground electrodes allow
sacrifice of more material before
gap size becomes too large
therefore service mileage is
increased.



Supplementary Gap

e.g. BUR6ET
BKUR6ET

Small gap between metal shell
and insulator nose allow carbon
to be burnt off by spark discharge
and restricts combustion gas
reaching insulator root.



Fine Wire Types

Smaller diameter centre electrodes allow a reduction
in voltage requirement, better gas flow around spark
position, less heat absorbing 'quench effect' and
more consistent spark position. Special precious metal
alloys employed at the electrode tips prevent high
rates of wear.

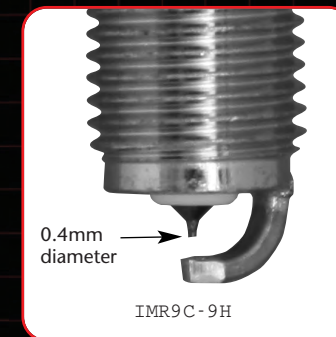
Iridium & Iridium IX

e.g. BKR6EIX
IFR5N10
IMR9C-9H
ITR6F13
LZFR6AI

Iridium alloy chip allows reduction
in centre electrode diameter as small
as 0.4mm. This offers reduction in
required voltage, a consistent spark
position, reduction of quench effect
more complete combustion and
lower emissions. Often used in
conjunction with platinum chip
on ground electrode.

Used in high stress, high performance
engines.

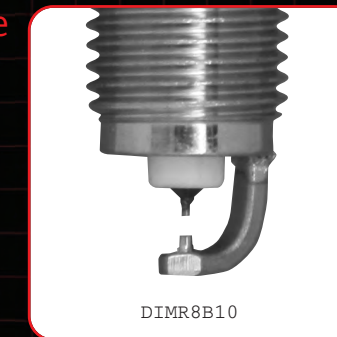
Some types, including all Iridium IX
plugs also have a taper cut ground
electrode to improve ignition quality
further.



Double Fine Electrode

e.g. DIMR8B10

Similar to other Iridium types
but with special projected
electrode welded to ground
electrode. Fastest, least
restricted flame kernel growth
and consistent spark position.
Typical use - high performance
off road racing motorcycle.



Competition & Racing Types

e.g. B7ECS
R7435-9
R7436-9
R0045J-10 - semi surface

Racing spark plugs are generally
constructed with higher heat ranges
due to the production of more
thermal energy from racing and
performance modified engines.

Different designs offer varying
projection into combustion
chamber to match engine design
and performance characteristics.

Ground electrode designs vary to
offer better engine flexibility or
resistance to damage by high levels
of combustion vibration and high
temperatures.

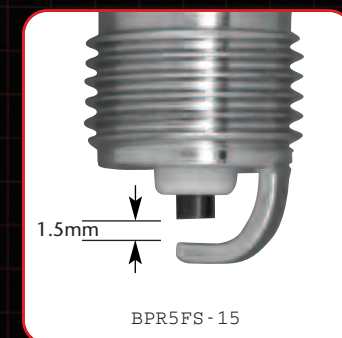
Semi surface design plugs similar to
the true surface discharge types
shown below offers the most robust
characteristics only used in the most
extreme conditions.



Wide Gap Types

e.g. BPR5FS-15

Wide gap plugs offer reduction
in emissions but require suitable
ignition coils to provide sufficient
voltage.



Multi Electrode

e.g. BCPR6ET
BKR6ETA-10

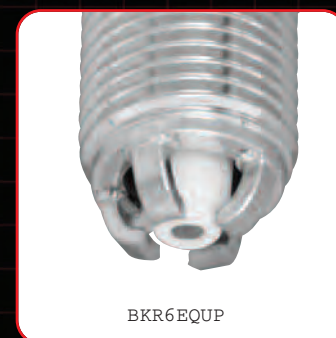
Three ground electrodes provide
large surface area for long service
life. These plugs often combine
other special features mentioned
elsewhere in this leaflet.



Semi Surface Types

e.g. BKR5EKU
BKR6EQUP

Spark always discharges across
insulator burning away carbon
deposits thereby offering excellent
resistance to fouling. This mechanism
also allows the use of large spark gap.



Single Platinum & Platinum VX

e.g. BKR6EVX
LFR5AP-11
TR6AP-13

Platinum alloy chip (typically
0.8mm diameter) is laser welded
to centre electrode. VX types also
have taper cut ground electrode
to further improve ignition quality.



Iridium & Iridium IX

e.g. BKR6EIX
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IMR9C-9H
ITR6F13
LZFR6AI



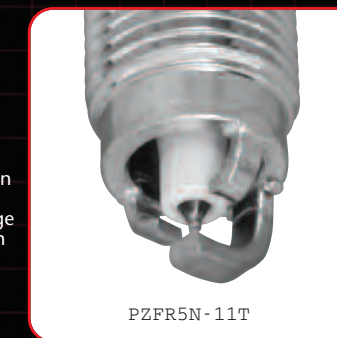
Hybrid Types

e.g. PZFR5N-11T

Excellent ignition quality offered by
platinum fine wire and single main
ground electrode design but should
excessive carbon become deposited on
the insulator nose additional auxiliary
side electrodes allow spark to discharge
to shell. This action suppresses drop in
overall insulator resistance.

- Spark is not 'lost'
- Unburnt fuel cannot reach catalytic converter

Extended shell design reduces ground
electrode temperature.



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e.g. B7ECS
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R7436-9
R0045J-10 - semi surface

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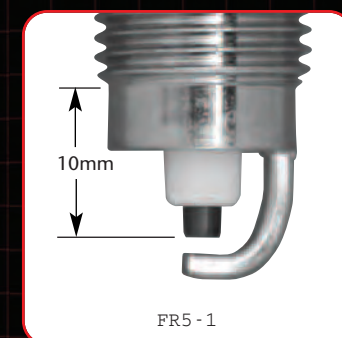
Semi surface design plugs similar to
the true surface discharge types
shown below offers the most robust
characteristics only used in the most
extreme conditions.



Extra Projected types

e.g. FR5-1
ZFR5E-11
ZFR5F

Spark position projected much
further into combustion chamber
providing stable combustion when
using leaner air/fuel mixtures. Only
use where specified.



Intermittent Gap

e.g. BKR6EK

Spark discharge at the intermittent
gaps can burn away carbon
deposits reducing possibility of
mis-sparking.

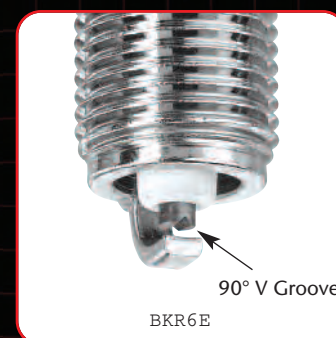


V-Grooved Types

e.g. BKR6E
BKR6EZ

90° groove cut in centre electrode
forces spark to occur at the periphery
of the electrode resulting in

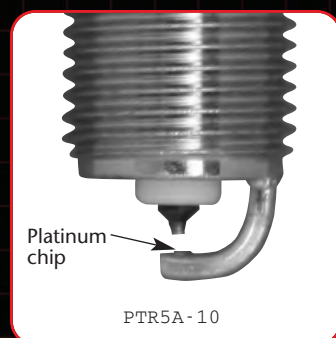
- less material to obstruct burn - faster flame kernel growth
- less heat energy absorbed by electrode mass - reduced quenching effect
- enhanced the potential gradient - less voltage required to create spark
- no loss of service life



Double Platinum

e.g. BKR6EP-11
PFR6N-11
PTR5A-10

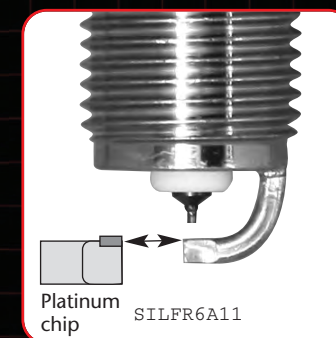
In addition to the centre electrode
a platinum alloy chip is platinum
alloy chip welded to ground
electrode to enhance service life
still further especially with dual
polarity ignition systems.



SPE type

e.g. SILFR6A11

To improve the ignitability of
conventional iridium plugs, a
special angular Platinum chip is
welded to the leading edge of
the external electrode. The centre
electrode is therefore less shrouded
by the ground electrode.

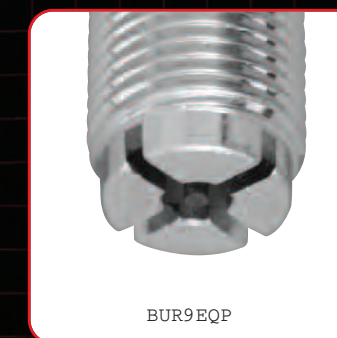


Rotary Engine Types

e.g. BUR9EQP
RE8C-L
RE9B-T

Special conditions in rotary engines
often dictate unusual features in
spark plugs which may include the
following:

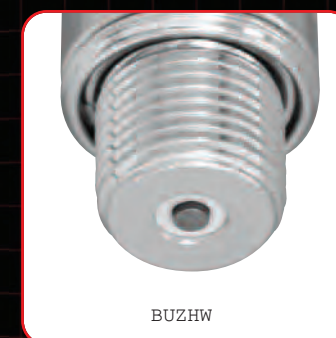
- High heat range plugs
- Different heat range in leading and trailing plugs
- Special protection of insulator nose
- Different thread reach for leading and trailing types
- Specific shell dimensions



Surface Discharge Type

e.g. BUZHW

True surface discharge design has
no given heat rating as the structure
of the plug prevents almost all rises
in electrode temperature. Wall of
insulator is in complete contact with
metal shell to dissipate heat quickly.
Used in some two stroke marine
engines with fast rise short duration
CDI ignition systems.



To find the
perfect match
for your engine,
see our latest
spark plug
catalogue or use
the part finder
facility on our
website at
www.ngkntk.co.uk.