14 Millimeter Thread, 3/8” Reach, 13/16” Hex, Gasket Seat, Resistor, Shielded Plug

M37 Spark Plugs - 14mm Thread, 3/8" Reach, 13/16" Hex

Autolite #	Old Autolite #	Heat Range	Mil Spec No.	New Champion #	Old Champion #	AC #	Motorcraft #	NGK No.
2243	AR5S	Cold	MS35909-1	588	XMJ14	WR44 or WR43	AR5S	
2244	AR6S			514	XEJ8	SR46E	AR6S	A6 OR A7
2245	AR7S	Medium	MS35909-2	517	XMJ17	WR46	AR7S	BPR6HS
2246	AR8S	Hotter	MS35908-1	567	XEJ12	SR47E	AR8S	XR45
2247	AR9S	Hot	MS35909-3	573	XMJ20	WR47	AR9S	

Firing tip configuration

As a rule of thumb, the more the spark gap is exposed to the air/fuel mixture, the easier to initiate combustion. Better combustion equates to more horsepower, improved throttle response and higher fuel economy. Unfortunately there is no one “best” tip configuration for all engines. Each plug manufacturer offers a variety of designs each with its own advantages and disadvantages. The only thing we found the plug techs agreed on was that for performance issues, a fine wire center electrode will provide a stronger spark from the existing voltage. However, fine wire electrodes will not survive in many modified motors. Fortunately, there are a variety of firing tips for you to choose from. After you have narrowed your plug choices according to your shell construction features and heat range, you will see each of the remaining choices have their firing tip described and pictured.

Heat range

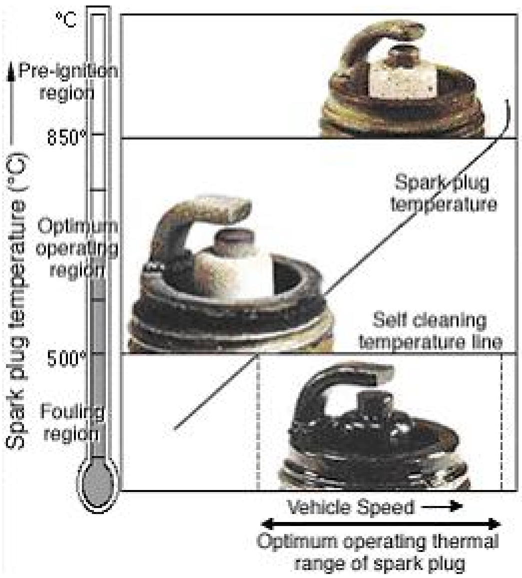
The term spark plug heat range refers to the speed with which the plug can transfer heat from the combustion chamber to the engine head. Whether the plug is to be installed in a boat, lawnmower or racecar, it has been found the optimum combustion chamber temperature for gasoline engines is between 500°C–850°C. When it is within that range it is cool enough to avoid pre-ignition and plug tip overheating (which can cause engine damage), while still hot enough to burn off combustion deposits which cause fouling.

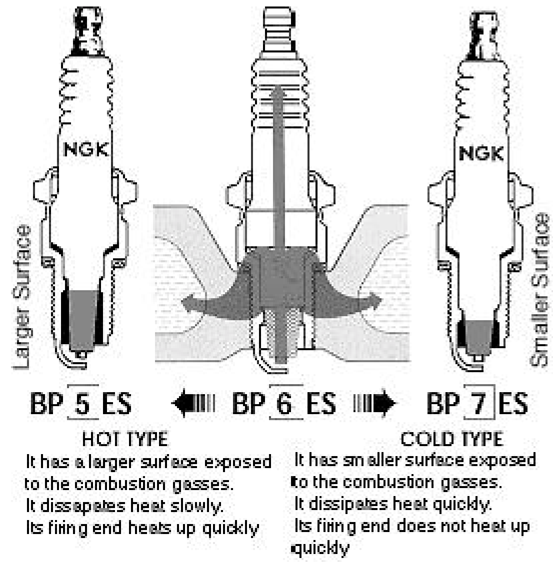
The spark plug can help maintain the optimum combustion chamber temperature. The primary method used to do this is by altering the internal length of the core nose, in addition, the alloy compositions in the electrodes can be changed. This means you may not be able to visually tell a difference between heat ranges. When a spark plug is referred to as a “cold plug”, it is one that transfers heat rapidly from the firing tip into the engine head, which keeps the firing tip cooler. A “hot plug” has a much slower rate of heat transfer, which keeps the firing tip hotter.

An unaltered engine will run within the optimum operating range straight from the manufacturer, but if you make modifications such as a turbo, supercharger, increase compression, timing changes, use of alternate racing fuels, or sustained use of nitrous oxide, these can alter the plug tip temperature and may necessitate a colder plug. A rule of thumb is, **one heat range colder per modification** or one heat range colder for every 75–100hp you increase. In identical spark plug types, the difference from one full heat range to the next is the ability to remove 70°C to 100°C from the combustion chamber.

The heat range numbers used by the various manufacturers are not universal, by that we mean, a 10 heat range in Champion is not the same as a 10 heat range in NGK. Some manufacturers numbering systems are opposite the other, for ***domestic manufacturers*** (Champion, Autolite, Splitfire), the ***higher the number, the hotter the plug***. For ***Japanese manufacturers (NGK, Denso), the higher the number, the colder the plug***.

Do not make spark plug changes at the same time as another engine modification such as injection, carburetion or timing changes as in the event of poor results, it can lead to misleading and inaccurate conclusions (an exception would be when the alternate plugs came as part of a single precalibrated upgrade kit). ***When making spark plug heat range changes, it is better to err on the side of too cold a plug***. The worst thing that can happen from too cold a plug is a fouled spark plug, ***too hot a spark plug can cause severe engine damage.***





Air fuel mixture

Theoretically the ideal air fuel ratio for gasoline motors is 14.7:1(14.7 lbs of air to 1 lbs. Fuel), however due to cylinder wall wetting, the fuel ratio is increased to 12.2 to 1. Ratios higher than this may be too lean and can contribute to pre-ignition or detonation. Ratios lower may be too rich and cause fouling although some favor a richer mixture due to a slightly slower burn and increased charge cooling (cooling from the air/fuel mixture on intake).

Pre-ignition

Ignition of the air/fuel mixture prior to its timed ignition by a spark from the spark plug is referred to as "pre-ignition". This can be caused by a hot spot in the combustion chamber, improper timing, too hot a spark plug, low octane fuel, too lean an air/fuel mixture, or engine overeating.

plug damaged due to sustained pre-ignition

Fouling

Fouling is when the spark plugs firing tip becomes coated with excessive fuel, oil, or combustion deposits so that it is unable to produce a spark. A plug can become fouled from continues low speed driving, improper spark plug heat range (too cold), improper timing (over-retarded), too rich an air/fuel ratio or an oil leak into combustion chamber. A variety of self-cleaning features are designed into most plugs to reduce fouling.


Wet fouled plug


Dry fouled plug

Timing

Advancing the ignition timing will raise the firing end temperature and becomes even more critical when compression ratios are also increased. Adjustment in spark plug heat range is likely necessary.

Compression ratio

An increase in the compression ratio raises both the pressure and the temperature within the combustion chamber. This will raise the spark plug tip temperature increasing the chances of pre-ignition. Adjustment in spark plug heat range is likely necessary, in addition, whenever compression ratios are altered, it may be necessary to modify the spark advance curve and recalibrate fuel system.

Fuel types

Alternate fuels can affect both heat range and the voltage required to fire the spark plug. Different types of fuel affect the required voltage as the bonding of the gas particles differs from one fuel to the next. Different fuels can also affect heat range. For example, when using LPG a colder spark plug is necessary, as LPG will raise the combustion chamber temperature. This is because LPG is already in a gaseous form on intake, therefore it does not use any heat to evaporate, this means there is less of a cooling effect available from the incoming air/fuel mixture. On the other hand, methanol, because of its heat vaporization properties, will aid in cooling, therefore a hotter plug is required.

Nitrous

Nitrous Oxide is an efficient means of getting more oxygen into the combustion chamber. Initially the
N2O injection will cool the incoming charge due to the energy expended on vaporization into the air fuel mixture. However, do to the dramatic increase in power output, the sustained use of N2O increases cylinder temperatures to the point *you may require a spark plug one or two heat ranges colder*. If the nitrous is used only for very short bursts, (less than 10 seconds), then the standard plug can likely be used with no spark plug heat change necessary.

Turbos and Blowers

Whether using a supercharger or a turbocharger, both have the effect of increasing the mass airflow into the engine which increases engine displacement. With the additional displacement comes not only an increase in horsepower, but also an increase in firing tip temperature, thus requiring a colder heat range spark plug. If however, you have added extreme boost or a combination of boost and other modifications, changing heat ranges may not be enough. Tip configuration may also need to be altered, as there are a variety of firing tip choices, it would be wise to consult your engine builder or performance tuner specialist for input.

Elevation

As the elevation increases, the atmosphere thins; this reduces the oxygen available and alters the air fuel ratio. At 1000ft, this can decrease horsepower nearly 3%, and almost 9.5% at 3,000ft. If a race is held at elevations considerably above sea level, the air fuel mixture should be leaned. The spark plug heat range should remain the same unless also at high elevations, (above 3000ft), in which changing to a hotter plug may be necessary. A small part of the lost horsepower may be regained by increasing the spark advance a few degrees.

Ambient Temperature

As the outside temperature falls, the air density rises which increases the air mass. This increase in mass raises the combustion pressure and temperatures, thus raising the spark plug firing tip temperature, possibly requiring a colder plug. Conversely with a higher outside temperature, you get the net effect of lowering internal plug firing temperatures, possibly requiring a hotter plug. However, it is only under racing conditions and extreme outside temperatures that a plug heat change would be warranted.

Humidity

As humidity increases, the air mass decreases. This lowers the combustion pressure and temperatures resulting in a decrease in the temperature of the spark plug firing tip. As humidity is only a very minor consideration in engine tuning, any performance alterations including changing spark plug heat ranges due to humidity should be considered only by an experienced performance tuner under serious racing conditions.

Indexing

Used by racing tuners only, indexing refers to a process whereby auxiliary washers of varying thickness are placed under the spark plug's shoulder so that when the spark plug is tightened, the gap will point in the desired direction. However, without running an engine on a dyno, it is impossible to gauge which type of indexing works best in your engine. While most engines like the spark plug's gap open to the intake valve, there are still other combinations that make more power with the gap pointed toward the exhaust valve.
In any case, engines with indexed spark plugs will typically make only a few more horsepower, typically less than 1% of total engine output. For a 500hp engine, you'd be lucky to get 5hp. While there are exceptions, the bottom line is that without a dyno, gauging success will be difficult.

Gap Settings

A spark plugs' tip temperature and the voltage necessary to fire the plug are directly affected by the gap setting. Most manufacturers set the gap from the factory for that plugs most popular application. Unfortunately, that plug may have hundreds of applications from automobiles to golf carts. Setting the gap for your particular engine is important as insufficient spark plug gap can cause pre-ignition, detonation and even engine damage. Whereas too much gap can result in a higher rate of misfires, loss of power, plug fouling and poor fuel economy. Even if the preset gap is supposed to match your motor, it is always best to physically check that the gap is adjusted properly for your motor prior to installation.
For modified motors, proper gapping is essential; gap settings are affected by increased compression, fuel type, turbos, nitrous and high output ignition system. Most experienced tuners know that opening the gap up to present a larger spark to the air/fuel mixture maximizes burn efficiency, however, after they have raised compression and installed a turbo, they have to lower the gap (to ensure ignitability in the denser air/fuel mixtures). It is for this reason that most racers add high power ignition systems. The added power allows them to reopen the gap without misfire.

Increasing ignition output allows you to open the spark plug gap without increasing misfires. Opening the gap up to present a larger spark to the air/fuel mixture maximizes burn efficiency and available horsepower. Many of the more popular aftermarket ignition systems are of the capacitive discharge type (CDI). They store voltage, or accumulate it, until a point at which a trigger signal allows release of this more powerful spark. Companies like Mallory, MSD, Crane and Accel, to name a few, offer such systems. Older non-computer controlled vehicles or engines that have been modified with higher compression or boost can certainly take advantage of a more powerful ignition system. When switching ignition systems, it is important to consult that manufacturer as to the use of resistor or non-resistor plugs.

The use of high power ignition systems should be restricted to modified motors or older motors with non-computer controlled ignition. Modern vehicles already have computer-controlled ignition, which do such a good job of igniting the air/fuel mixture that added ignition capacity would do little to improve fuel ignition.

Plug torque settings

It is essential to tighten a spark plug to the specified turning angle or torque setting. This is for a number of reasons, over tightening can cause;
1) Damage to the threads in the cylinder head (especially aluminum heads).
2) Damage the threads of the spark plug.
3) Damage the internal seal of a spark plug allowing combustion chamber blow-by.
Under tightening of the spark plug can cause plug overheating and possibly pre-ignition. This is because one of the primary purposes

of the spark plug is to remove heat from the combustion chamber, it does so by transferring that heat to the engine head. If the plug is not properly tighten it will not have sufficient contact with the head to transfer that heat. Proper tightening procedure is described below.

Screw in the spark plug finger tight until the gasket meets the cylinder head. Then seat the plug/gasket with a torque or turning angle wrench as specified in the chart below

Spark plug type	Thread Diameter	Cast Iron Cylinder Head (lb-ft.)	Aluminum Cylinder Head (lb-ft.)
Flat seat type (with gasket)	18 ø mm	25.3~32.5	25.3~32.5
	14 ø mm	18.0~25.3	18.0~21.6
	12 ø mm	10.8~18.0	10.8~14.5
	10 ø mm	7.2~10.8	7.2~8.7
	8 ø mm	--	5.8~7.2
Conical seat type (without gasket)	18 ø mm	14.5~21.6	14.5~21.6
Conical seat type (without gasket)	14 ø mm	10.8~18.0	7.2~14.5

Resistor plugs for race engines

It is strongly recommended resistor spark plugs be used in any motor that has on-board computer systems to monitor or control engine performance. Use of a non-resistor plug in certain applications can actually cause the engine to suffer undesirable side effects such as an erratic idle, high-rpm misfire, engine run-on, power drop off at certain rpm levels and abnormal combustion. Resistor plugs are also recommended on any vehicle that has other on-board electronic systems such as, two-way radios, GPS systems, depth finders or whenever recommended by the manufacturer.

If you have an outboard marine CDI (capacitive discharge ignition), (such as Johnson and Evinrude), make sure to use a plug with an inductive type resistor (such as a Champion Q-type or NGK Z-type). Use of non-inductive resistor type plugs on these motors can create an open circuit within the spark plug (it will become a dead plug).

Mallory, MSD, Crane and Accel also produce a high output ignition CDI system, however, these should not be confused with a marine style CDI as mentioned above. For an automotive high output CDI system it is imperative you consult that manufacturer for plug specifications for their system. Some high out put systems specify the use of resistor plugs, while others will fry the internal plug resistor turning its 5k ohms into 60k ohms.

As a rule, performance is in no way impaired by resistor spark plugs. The only exception to this may be some models of high output CDI specify non-resistor plugs.

What is a racing plug?

Most "racing" spark plugs are just colder heat ranges of the same street versions spark plug. Their internal construction is no different than their standard heat range equivalents. Racing spark plugs do not make more power in an engine, rather, they allow the engine to make more power. Meaning, after all the engine modifications are done that add power, a racing plug is better designed to operate in the torturous conditions created by those modifications. If you used a regular plug in a modified race engine, it would quickly be destroyed, while a properly selected racing plug would endure the extreme limits of that motor. Take that same racing plug, however, put it in an unmodified motor, and it would foul out within minutes.

The differences between a racing plug and traditional plug are not solely heat range. There are firing tip configurations necessary for survival in alternate fuel racing and situations of extreme boost/compression (such as retracted-nose insulators or surface gap firing tips), which would run very poorly in an unmodified motor. However, there are some very effective race plug design features including ultra-fine wire electrodes, gold palladium, platinum, iridium electrodes and cut back ground electrodes that are now available in standard non-racing heat ranges, these can maximize fuel combustion and improve performance in unmodified motors as well.

Fine wire

Fine wire center electrode come under a variety of names depending on manufacturer, IE:(Tapered point, Ultra-Fine electrode, Taper cut electrode, Necked down electrode). Originally designed to improve starting and reduce fouling in two-stroke engines, this design was found to improve performance in four-stroke engines as well. All operate on primarily the same principle, a spark plug with fine wire electrodes will perform better than a traditional plug. There are two reasons for this, first is because a smaller center electrode requires less voltage to jump the gap. This means fewer misfires, which should be seen in higher mileage and more horsepower. The second reason is smaller center electrodes reduce quenching. The smaller center electrodes have required exotic metals such as platinum or iridium so that they can still maintain (and sometimes surpass) the longevity of a traditional spark plug. Currently the finest wire performance plugs available are made by Denso at 0.4mm diameter and by NGK at 0.7mm diameter, a traditional center electrode is typically 2.0 to 2.5mm.

Ultra fine wire center electrode, 0.4mm

Ultra-fine wire NGK iridium, 0.7mm

Fine wire Champion, 1.1mm

Gold Palladium

Gold is an excellent conductor of electricity which makes it well suited for a performance plug. However gold is also a very soft metal, therefore the gold alloy is mixed with palladium, (a much harder metal), to form a premium fine wire performance plug with increased ignitability and durability.

Platinum

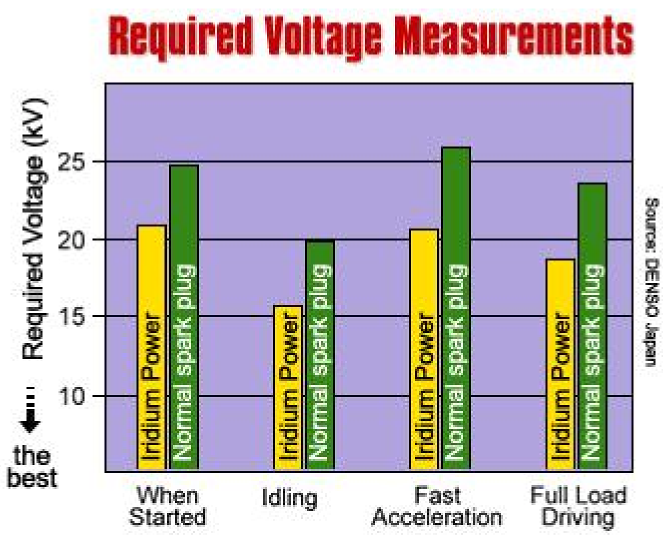
Platinum is a precious metal used by nearly all spark plug manufacturers on there long life and/or performance spark plugs. This is because of platinum's high melting point which makes it useful in two ways. On a long life spark plugs a thin wafer of platinum is bonded at the firing point to the center electrode (and possibly ground electrode) solely so they don't wear as fast as a traditional plug. On a fine wire performance plug, the very tip of the center electrode is made of platinum so that the fine wire tip will last longer. Do not be fooled, all platinum plugs are not created equal, Platinum is a very expensive precious metal, a $2 platinum spark plug will not have much platinum in it, and therefore will not last as long as a $12 platinum spark plug. Some platinum plugs have only the center electrode tipped with platinum, while others have both the center and ground electrodes platinum tipped. (By the way, it is still not suggested that platinum plugs be used on vehicles with nitrous injection. Thus far, there has been no problems reported regarding using iridium plugs with nitrous.)

Platinum tipped ground with fine wire platinum center electrode

Platinum tipped center and ground electrode

Iridium

Iridium is a precious metal that is 6 times harder and 8 times stronger than platinum, it has a 1,200=F higher melting point than platinum and conducts electricity better. This makes it possible to create the finest wire center electrode ever. Prior till now, spark plug manufacturers have favored platinum for their long life or performance spark plugs due to its high melting point, also the technology did not exist to machine and bond iridium on a spark plug electrode(at least in a cost effective manner). Champion spark plugs had already made an iridium industrial application spark plug, but it still sells for over a hundred dollars per plug. Just now is the technology available to effectively use iridium in a spark plug for automotive applications. The strength, hardness and high melting point of iridium make it very well suited for a fine wire plug. The primary iridium plug manufacturers at this time are Denso with a 0.4mm center electrode and NGK with a 0.7mm center electrode. Both are the best performance plugs on the market for traditional automotive use and many racing applications.



Graph applies to Denso Ultra-fine wire Iridium spark plugs

	Iridium (Ir)	Platinum (Pt)	Nickel (Ni)	Gold (Au)	Silver (Ag)
Melting Point (=F)	4449.2	3216.2	2647.4	1945.4	1760
Strength (Kpsi)	159	19.9	96.5	18.5	18.5
Electrical resistance (mW>in)	2-3/32	4-11/64	2-11/16	29/32	5/8
Hardness (HV,68=F)	240	40	160	25	26

Comparison of metal properties

Cut back ground

Ground electrodes come in a variety of shapes and sizes. They are also called by a variety of names depending on manufacturer, IE: trapezoid cut ground, tapered cut ground, fine wire ground, angled ground, trimmed side electrode, wedge shaped ground, inverted V-tip ground, cut back ground, etc. All have the same purpose, to reduce quenching and shadowing.

Traditional ground

Cut back Ground

Trapezoid cut

Inverted V-tip ground

Trimmed side electrode

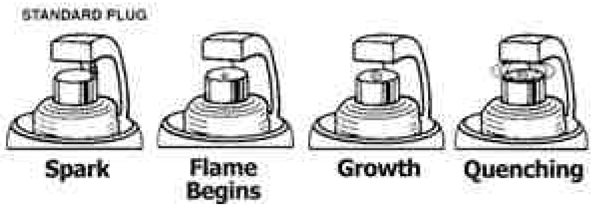
Tapered cut ground

Wedge shaped ground

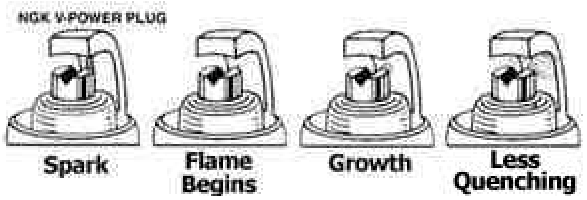
Quenching

To understand quenching and how it is reduced it is first necessary to review the basic purpose of the spark plug is to ignite the air fuel mixture in the combustion chamber. To do this your vehicle ignition system generates tens of thousands of volts to jump the gap between the center and ground electrodes. However it is good to know that it is not the actual electricity that ignites the air fuel mixture, it is the heat energy generated by that electricity or spark. Therefore when you are creating the spark you want as much of the heat from that spark to be used to ignite the air fuel mixture and not have the heat from that spark be re-absorbed by the center and ground electrodes. Thus each manufacturer uses a variety of designs(cut back ground electrodes, U grooves in the ground electrode, V-grooves in the center electrode, fine wire center and ground electrodes, tapered or beveled cut ground electrodes, etc.) all to try to reduce quenching by reducing the contact(surface) area between the electrodes and the flame nucleus.

Cut back ground



Quenching of standard spark plug



V-power reduces quenching

U-groove reduces quenching

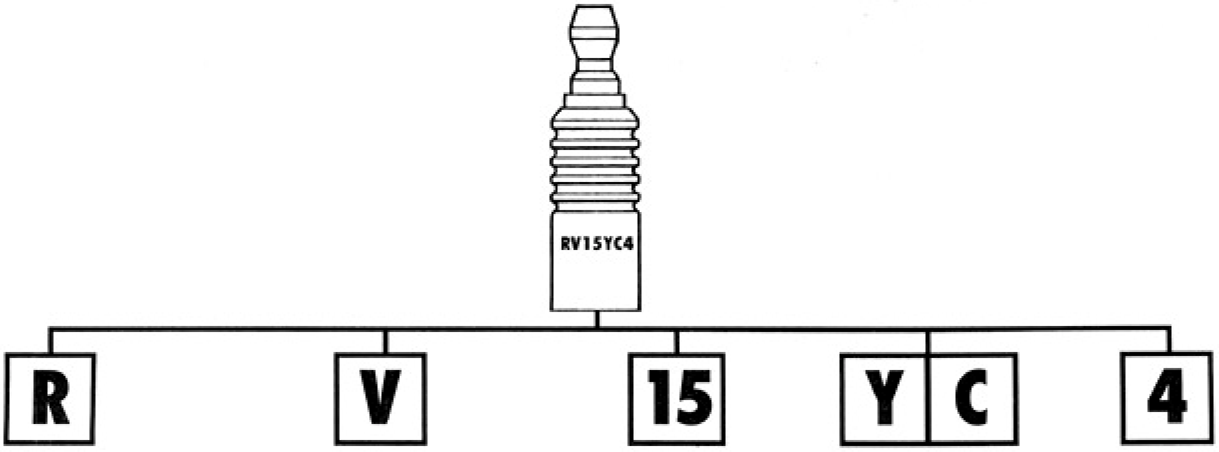
Shadowing

To understand shadowing, it is good to understand first that all vehicle manufacturers try to place the tip of the spark plug within the center of the combustion chamber (that is the center of the combustion chamber with the piston at top dead center). This is to expose as much of the air fuel mixture as possible to the ignition spark, the more air/fuel exposed, the likelier chance of complete ignition (less misfires). But just as putting a board in front of a flashlight will block the light from everything behind that board, so the ground electrode can block a portion of the air fuel mixture from exposure to the spark. Thus a variety of ground electrode designs are available(fine wire ground, cut back ground, angled ground, etc) all help to reduce shadowing.

When are racing plugs necessary?

Not all modifications would require the use of racing plugs. Modifications that do not alter the overall compression ratio will not usually necessitate changing plug types or heat ranges. These would include free-flowing air filter, headers, mufflers and rear-end gears. Such minor modifications will not significantly increase the amount of heat in the combustion chamber; hence, a plug change is not warranted. However, modifications that introduce new fuel types or alter compression ratios such as turbo charging, supercharging, nitrous oxide injection, modified cylinder heads or piston configurations, to name a few, generally require a change from stock spark plugs. This is because, with compression increase comes additional heat which requires a colder plug, with fuel and altered piston/plug clearances can come firing tip configuration changes. Typically, for every 75-100 hp you add, you should go one full step colder on the spark plug's heat range. If you have gone too cold you may see severe oil or fuel fouling.

Champion Part Numbering Scheme



RESISTOR

Letter	Description
B	Standard Height
C	Bantam Height
D	Bantam Height
E	Shielded 5/8"—24
G	1"—20 Female Connector
H	Shielded 3/4"—20
K	Resistor
M	Shielded 5/8"— 24 Ordnance
Q	Resistor—CDI
R	Resistor
S	Shielded 11/16" —24 Whitworth
T	13/16"—20 Thread Above Hexagon
U	Auxiliary Gap
X	Resistor

SHELL DESIGN

Letter	Thread Size	Reach	Hex
A	12mm	3/4"	11/16" or 18mm
B	18mm	13/16"	7/8"
C	14mm	3/4"	5/8"
D	18mm	1/2"	7/8"
E	14mm	1.0" Taper Seat	5/8"
F	18mm	.460" Taper Seat	13/16"
G	10mm	.750"	5/8"
GC*	7/8"-18	All	7/8"
GM*	18mm	All	7/8"
H	14mm	7/16"	13/16"
J	14mm	3/8"	13/16"
K	18mm	All	1"
L	14mm	1/2" or .472"	13/16"
M	18mm	1/2"	7/8" or 11/16"
N	14mm	3/4"	13/16"
P	12mm	.492"	11/16"
R	12mm	3/4"	3/4" or 11/16"
S	14mm	.708" Taper Seat	5/8"
S	1-1/8"	5/8"	1"
U	18mm	1-1/8"	7/8"
V	14mm	.460" Taper Seat	5/8"
W	7/8"-18	All	15/16" or 1
X	14mm	.500"	5/8"
Y	10mm	1/4"	5/8"
Z	10mm	.492"	5/8"

*1"-20 Female Connector

Letter	Thread Size	Reach	Hex
BL or V	14mm	.460" Taper Seat	5/8"
BN or S	14mm	.708" Taper Seat	5/8"
CJ	14mm	3/8"	3/4" or 13/16"
DJ	14mm	.325" Taper Seat	5/8"
DZ	10mm	.500" Taper Seat	5/8"
FN or C	14mm	.750" w/gasket	5/8"

The sales symbol on a spark plug is composed of a basic "Heat Range" number with letters and numbers to indicate major features of the plug design. The charts above contain a detailed example of the Champion Sales Symbol.

HEAT RANGE/ APPLICATION

Ref.#	Description
1-25	Automotive, Small Engine & Ordnance
26-50	Aviation
51-75	Hi-Performance
75-99	Industrial & Special Applications

FIRING END DESIGN

Letter	Description
None or A	Conventional
B	Two Ground Electrodes
C	Copper Plus Design
D	Protruding Nose, Round Ground Electrode
E	.290" Core Nose Projection
F	Three Ground Electrode
G	Fine Wire—Semi-Precious Electrode
H	.030" Core Nose Projection
J	Cutback Ground Electrode, Includes Modified Gap
L	Skirted Shell Firing End .200" Core Nose
M	Projected Core Nose
N	Four Ground Electrode
P	Platinum Electrode
R	Push Wire
S	Single Ground Electrode at Side of Center Electrode
V	Surface Gap
X	Fine Wire
Y	Standard Projected Core Nose
Z	Skirted Shell
CC	Double Copper
*PP	Double Platinum
PEP	Double Platinum Projected
PLP	Double Platinum Extended Electrode
PMP	Double Platinum Projected
PYC	Single Platinum Projected
*PYP	Projected Double Platinum
WPC	Iridium/Platinum/Copper
WPCC	Iridium/Platinum/ Double Copper

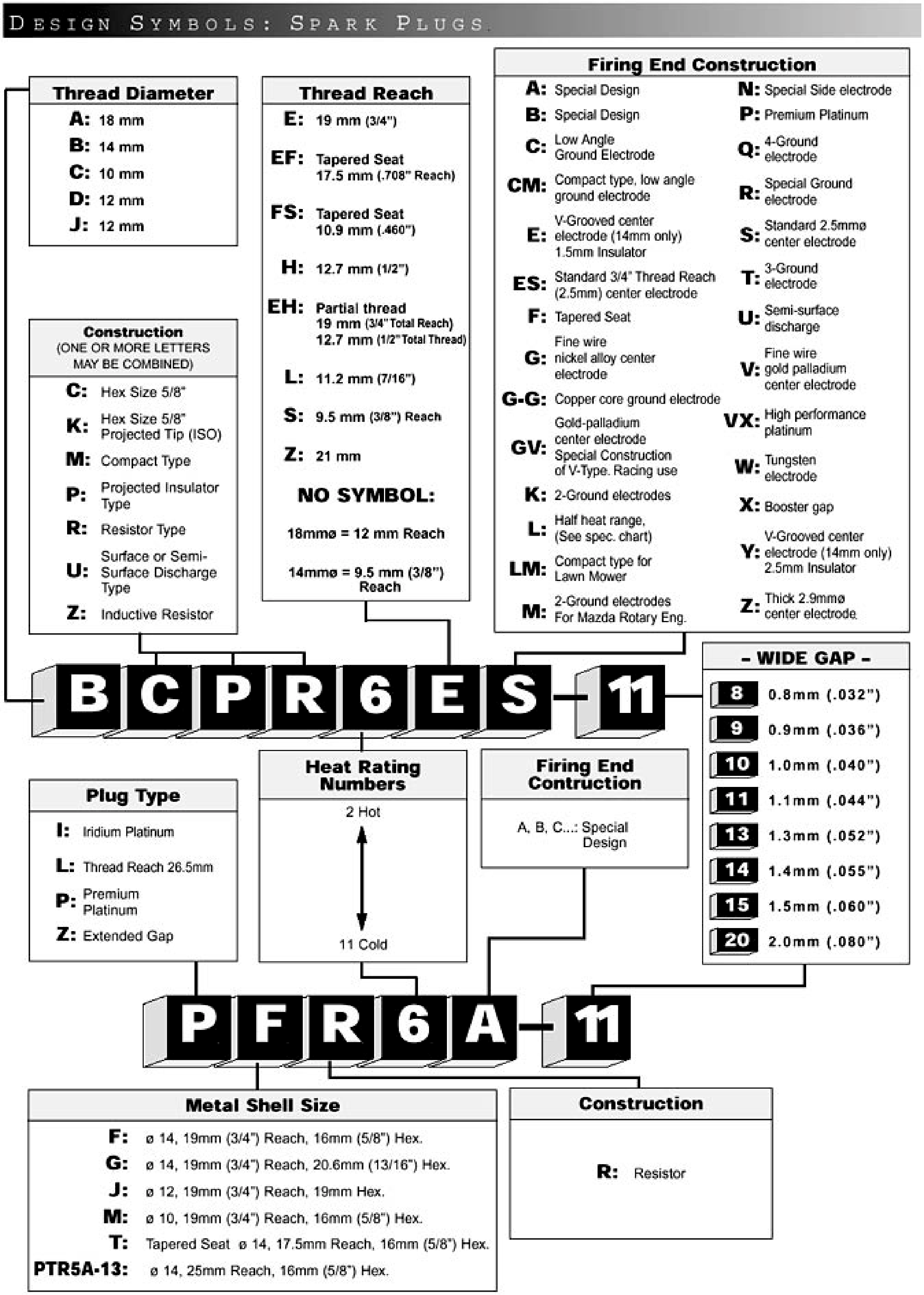
*Includes Copper Plus Design

Letter	Description	Reach	Hex
BY	Multiple Ground Electrode w/Projected Core Nose		
CM	14mm (Special for Mopeds)	.472"	13/16"
GY	Fine Wire (Semi-precious Electrode) w/Projected Core Nose		
LM	14mm (Special for Lawn Mowers)	3/8"	13/16"
LY/E	Extended Electrode Gap & Core Nose Projection		

WIDE GAP DESIGNATION

No.	Description
4	Wide gaps required
5	to meet Federal
6	and California
8	requirements.

NGK Part Numbering Scheme



Denso Part Numbering Scheme

I	Iridium Power Plug	X	Special Design
W	Thread Size and Hex Size	R	Internal Construction
16	Heat Range	-U	Special Gap Configuration
E	Thread Reach	11	Gap

I

Letter	Description	Example
I+	Iridium Power performance plug .4mm Iridium center electrode	IK20

W

THREAD SIZE AND HEX SIZE

Letter	Thread Size	Hex. Size	Description	Letter	Thread Size	Hex. Size	Description
L	18mm	27.0mm		SK*	14mm	16.0mm	Iridium tipped electrode
M	18mm	25.4mm		S	14mm	20.6mm	Special surface gap for Mazda R.E./thread reach 21.5mm
MA	18mm	20.6mm	Taper seat	SF	14mm	20.6mm	Surface gap
J*	14mm	20.6mm	Extended electrodes	T	14mm	20.6mm	Taper seat
P*	14mm	20.6mm	Platinum tipped electrodes	W	14mm	20.6mm	
PQ*	14mm	16.0mm	Platinum tipped electrodes	X	12mm	18.0mm	
Q*	14mm	16.0mm		XU	12mm	16.0mm	
QJ*	14mm	16.0mm	Extended electrode	U	10mm	16.0mm	
K*	14mm	16.0mm	ISO	Y	8mm	13.0mm	
KJ*	14mm	16.0mm	ISO				
PK*	14mm	16.0mm	Platinum tipped electrodes				

16

HEAT RANGE

HOT ◄——————► COLD

9 14 16 20 21** 22 24 25** 27 29** 31 32** 34 37

E

THREAD REACH

Letter	Reach	Description
E (Flat seat)	19.0 (3/4") or 20.0mm	W16EXR-U W20EBR
E (Taper seat)	.708"	T16EPR-U
F	12.7mm (1/2")	W20FP-U
ES	19.0mm (3/4") Half thread	U24FER-9
G	21.8mm	Q20PR-U
L	11.2mm (7/16")	W14L
None		
18mm Thread (Flat seat)	12.0mm	M24S, L14-U
14mm Thread (Flat seat)	9.5mm (3/8")	W20S-U, W9PR-U
18mm Thread (Taper seat)	.460"	MA16PR-U
14mm Thread (Taper seat)	.460" or .375"	T16PR-U T20R-U

X

SPECIAL DESIGN

Letter	Description	Example
A	Dual ground electrodes for Mazda R.E.	W22EA
A***	Electrode projection (7.0mm)	Q20AR-U
B	Triple ground electrodes	W20EPB
B***	Electrode projection (9.5mm)	J16BR-U
C***	Electrode projection (5.0mm)	Q20DCR11
D	4-ground electrodes for Mazda R.E.	W27EDR14
H***	Electrode projection (8.5mm)	Q20HR-U
K	Special type for Honda CVCC	W16EKR-S11
LM	Special type for Lawnmowers	W14LM-U
M	Compact type	W20M-U
N	Racing type (nickel ground electrode)	W27EN
PS	Racing type (platinum ground electrode)	W27Eps
P	Projected insulator nose	W16EP-U
S	Regular type	W24ES-U
T	Dual ground electrodes for Toyota T.G.P.	W20ET-S
X	Extra projected insulator nose	W16EX-U

R

INTERNAL CONSTRUCTION

Letter	Description
None	Non-resistor
R	Resistor

-U

SPECIAL GAP CONFIGURATION

Letter	Description	Example
GL	Platinum center electrode	X22EPR-GL
L	Special type for Honda CVCC and extra project type for moped	W20ESR-L11 W16FP-UL
S	Semi-surface gap	W20EPR-S11
U	U-grooved ground electrode	W16ES-U
US	Star center electrode with U-groove	W14-US
V	Thin center electrode	W24ES-V
Z	Thin platinum center electrode with tapered ground electrode	W24ES-ZU
C	Cut-back ground electrode	W27ESR-C
P	Platinum tipped plug for DIS	PQ20R-P8

11

GAP

Number	Gap
8	0.8mm / .032 in.
9	0.9mm / .035 in.
10	1.0mm / .040 in.
11	1.1mm / .044 in.
13	1.3mm / .050 in.
14	1.4mm / .055 in.
15	1.5mm / .060 in.
20	2.0mm / .080 in.

*The thread reach for these letters are 19.0mm. **Special heat range. ***When the first suffix is J or QJ.

Autolite Part Numbering Scheme

Every spark plug company has a unique numbering system that may or may not have some built in meaning. Autolite® spark plug numbers indicate the heat range with the last number of the part number. Everything previous to that, regardless of the number of digits, can only be used to indicate a similar design (spark plug family). For example, a 23 is one heat range colder than a 24. 3924 is one heat range hotter than the 3923. The 23 and 24 will look exactly alike, but they will not look like the 3923 or 3924.

Some part numbers also use prefixes to indicate special features. AP as in AP24 indicates a platinum center wire on a 24. APP indicates a platinum center wire and a platinum ground (or side) wire. MP is for motorcycle platinum and WC is especially for personal watercraft.