Ignition System Components Recommendation 280SL (not transistorized)

If engine runs a bit rich, may try a bit hotter plugs.
If engine runs a bit lean, may try a bit colder plugs.

BUT DO NOT COMPENSATE WITH SPARK PLUG HEAT RANGE FOR WRONG MIXTURE SETTING!

	Moderate Climate		Warm Climate (do we need it?)		
	Original Distributor	123 Distributor**	Original Distributor	123 Distributor*	Component PN
Coil	Red, 1.8Ω resistor. Black, 0.9Ω resistor*.	Red (or minimum 1Ω) without resistor	Red with 1.8Ω resistor.	Red (or minimum 1Ω) without resistor	Coil red A0001580603, 2703, 4903 Bosch 0221119030
Leads type	Copper core Beru, Bosch	Copper core Beru, Bosch	Copper core Beru, Bosch	Copper core Beru, Bosch	e.g. Beru 7MMSBLACK
Cap connectors resistance	0 resistance.	0 resistance.	0 resistance.	0 resistance.	Rubber cap A0001591585, Connector A0001590038
Spark plugs connectors type/resistance	1kΩ resistance Beru, Bosch	1kΩ resistance Beru, Bosch	1kΩ resistance Beru, Bosch	1kΩ resistance Beru, Bosch	A0001565210, A0001564910 Bosch 0356301022
Spark plugs resistance/gap	0 resistance/0.8mm Bosch W (not WR)	0 resistance/0.8mm Bosch W (not WR)			
Spark plugs in town/relaxing driving	BP5ES (red coil), BP6ES, BP7ES (black coil) W9DC, W7DC	BP5ES, BP6ES W9DC, W7DC			
Spark plugs highway/freeway/sport driving	BP7ES W7DC, W5DC	BP7ES W7DC, W5DC			

Symptoms if your plugs are too hot (too high combustion temperature):

- Spark plug electrodes burnt off, melted
- Very clean, glazing insulator.
- ..

Symptoms if your plugs are too cold (too low combustion temperature):

- Residues on insulator despite mixture set ok.
- …

Bosch W9DC is hotter than W7DC
NGK BP5ES is hotter than BP6ES

hotter

Bosch	NGK
W5DC	BP7ES
W5DCO	BP7ES
W6DC	BP6ES
W7DC	BP6ES
W8DC	BP5ES
W9DC	BP5ES

colder

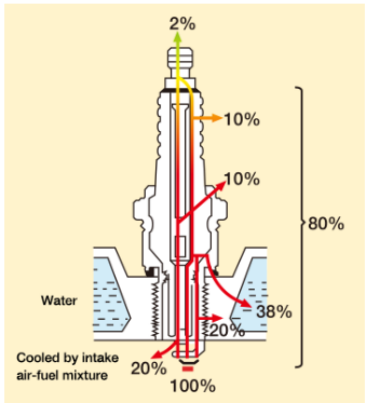
Remarks:

- MB parts lists contain W5DC/O or W7DC (found in for US Air Pollution control). Various part numbers for the US.
- NGK recommendation for 280SL: BP7ES.
- *Member's opinion: the black coil set up may work better without a resistor.
- Spark plug heat value/range NGK/Bosch coding difference explanation on the next page.
- 123 Setting for Euro cars are shown on page 3.
- **On 123 Ignitoin pages carbon core leads are offered as well as WR (resistor) plugs. This is TBC for now, to be sorted.
- Details regarding leads and connectors can be found in the Technical Manual https://www.sl113.org/wiki/Electrical/SparkPlugWires
- Details regarding coils can be found in the Technical Manual https://www.sl113.org/wiki/Electrical/IgnitionCoil
- These recommendations are not for transistorized ignition.

Spark Plugs Heat Range Explanation

Spark plug heat dispersal

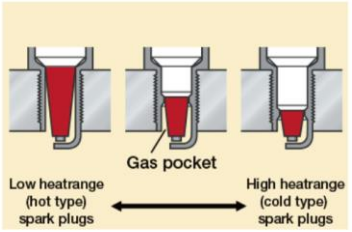
The heat that the electrode section of the spark plug receives due to combustion is dispersed through the path in the figure.
The degree to which a spark plug disperses the heat it receives is called its "heat range". Spark plugs with a high degree of heat dispersal are called high heat range (cold type) and those with a low degree of heat dispersal are called low heat range (hot type).
This is largely determined by the temperature of the gas inside the combustion chamber and the spark plug design.



Addition from Members:
- "Hot" spark plug – less heat dispersing, low heat range. "Cold" spark plug – more heat dispersing, high heat range.
- Different classification of Bosch and NGK:
  - Bosch W7DC is colder than W9DC – the higher the number the hotter the spark plug (the less heat dispersion)
  - NGK BP5ES is hotter than BP7ES – the lower the number the hotter the spark plug (the less heat dispersion)

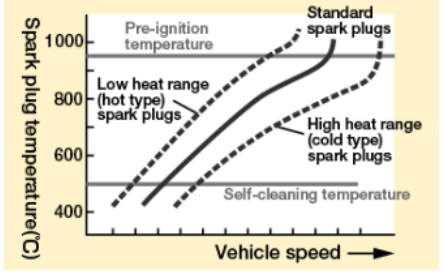
Low heat range and high heat range

Low heat range plugs have long insulator leg sections and the surface area affected by the flame and the gas pocket capacity are large.
Also, since the heat release path from the insulator leg section to the housing is long, heat dispersal is low and the temperature of the center electrode rises easily.
On the other hand, high heat range plugs have short insulator legs and the surface area affected by the flame and the gas pocket capacity are small.
Also since the heat release path from the insulator leg section to the housing is short, heat dispersal is high and the temperature of the center electrode does not rise easily.



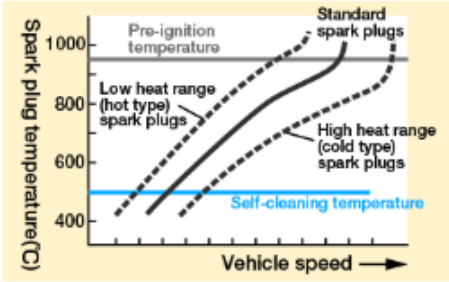
Spark plug temperature and vehicle speed (1)

The relationship between the spark plug temperature and vehicle speed and heat range is expressed with a graph like that in the figure. There are restrictions on the temperatures at which spark plugs can be used: the lower limit is the self-cleaning temperature and the upper limit is the pre-ignition temperature.A spark plug only functions completely when its center electrode temperature is between these temperatures of about 500°C and 950°C.



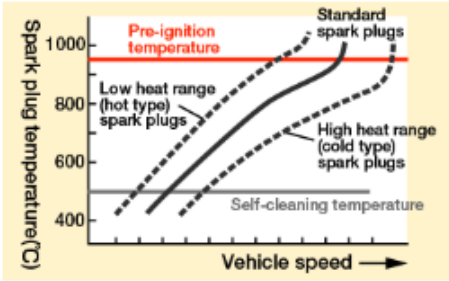
Spark plug temperature and vehicle speed (2) - self-cleaning temperature

When the center electrode temperature is 500°C or lower, free carbon generated when the fuel does not combust completely is deposited on the surface of the insulator. Therefore, the insulation between the insulator and the housing falls, electricity leaks occurs, the spark across the gap is incomplete, causes ignition failures.
This temperature of 500°C is called the self-cleaning temperature because above this temperature the carbon is naturally burnt away completely by combustion.



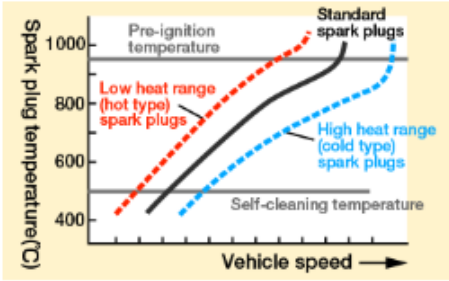
Spark plug temperature and vehicle speed (3) - pre-ignition temperature

When the center electrode reaches 950°C or higher, pre-ignition (early ignition) occurs, meaning that the electrode serves as a heat source and ignition occurs without a spark. Therefore, output falls and this can reach the level of electrode wear and insulator damage.



Spark plug temperature and vehicle speed (4)

Low heat range spark plugs have center electrode temperatures that rise easily and even at low-speed, they easily reach the self-cleaning temperature, so carbon is not deposited easily on the insulator section.
On the other hand, high heat range spark plugs have center electrode temperatures that do not rise easily, so they are unlikely to reach the pre-ignition temperature even at high speed.
Therefore, this type of spark plug is generally used for high speed, high output engines.
That is why it is necessary to select spark plugs with the appropriate heat range for the engine characteristics, running conditions, etc.

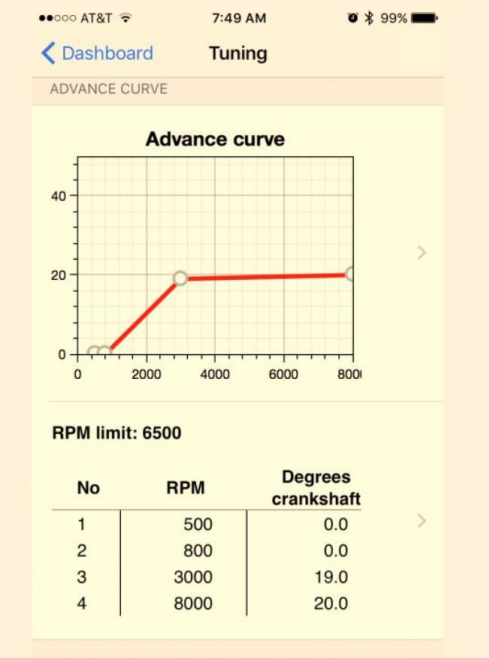


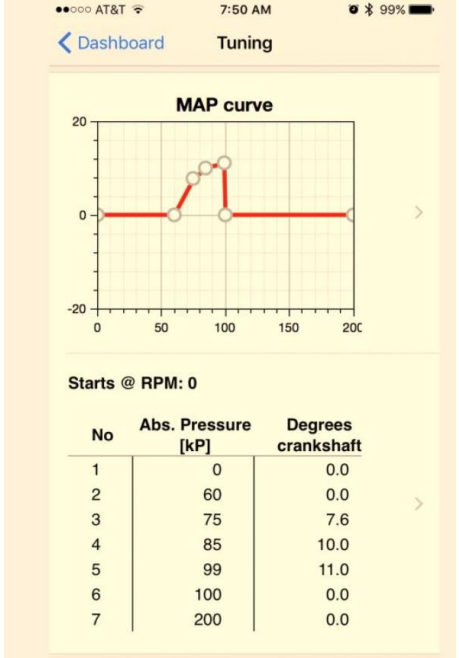
https://www.denso.com/global/en/products-and-services/automotive-service-parts-and-accessories/plug/basic/heatrange/

123 Settings

Note: this are Members recommendations. May turn out you need to come up with your own ones that would work best for your car.

- Example of 123 setting





*In terms of the US configuration cars, then for the standard 123ignition, program E would be right, given that all the vacuum shut-off gears and relays are still working correctly (though they rarely are). I think Mike uploaded some US curves for the programmable 123ignition in another thread.

*For the Euro cars, program 8 will work, if the original European throttle body, sourcing vacuum from below the throttle body, is intact, or have been installed as a Euro-conversion of a US car.

From 123 USA:

curve	advance starts [rpm crankshaft]	max. advance [rpm/	degr. crankshaft]	vac. adv. starts [mmHg]	max. vac. adv. [mmHg/	degr.]	replaces	remark
8	1000	2500	22,0	-	-	10,0*	BOSCH 0 231 116 051, 0 231 185 009	W108, W109, W111, W113
E	1000	2500	20,0	-	-	10,0*	BOSCH 0 231 116 061, 0 231 116 062, 0 231 116 066	W108 280SE, W109 300SEL, W113 280SL

Link to 123 USA for more curves:https://123ignitionusa.com/mercedes-with-6-cyl-engines-63-and-up-merc-6-r-v-will-not-fit-c-models/

- Curve 8 is indicated for distributors BOSCH 0 231 116 051, 0 231 185 009
- Curve E is indicated for distributors BOSCH 0 231 116 061, 0 231 116 062, 0 231 116 066

Quotes from Members:

On a standard ignition system, less resistance is better. The standard black coil is 13 KV and the ballast resistor is .9 ohms with NGK BP7ES plugs and 1 ohm spark plug ends. 8 degrees BTDC at idle for early distributors and 38 degrees BTDC full advance. This is all standard specs.

I changed those specs up a bit when I added the red 26KV coil. That requires a 1.8 ohm ballast resistor because the voltage is doubled coming from the coil. Spark plug ends are still 1 ohm but I moved up to the hotter BP5ES plugs which heat up more quickly and have less tendency to foul out. Spark plug wires are all solid metal core with no resistors at the distributor cap. I want all the juice that the coil can make going directly to the spark plugs. The coil wire should also be a solid metal core type with no resistors. Ignition timing would remain the same. You can take this info to the bank.

I'm not as familiar with the 123 system but there's a whole bunch of conflicting info that makes little sense to me. If it's electronic, why do you need a ballast resistor, and why .9 ohms? Secondly, why use carbon core wires? You only have 26 KV and in my mind the carbon core wires would knock the voltage down to less than what the 13 KV coil provided. Later model MB engines with electronic distributors continued to use metal core wires well into the 80's and possibly beyond that. Why put asystem on that you have to dampen the spark? You might as well stick to the standard system.