

# VINTAGE LAMBRETTA & VESPA SPARK PLUG SELECTION & USE



Selecting the correct spark plug for your vintage scooter is not as easy as one might believe. This is because today there are far more brands and varieties of spark plugs available than in the 1960's when your vintage scooter was made. To make matters worse, many of the spark plugs being sold today have been designed for modern and not vintage engines and are fitted with an internal resistor that actually reduces the voltage to the spark plug and so reduces the spark size. The main purpose of this resistor is to reduce RFI (Radio Frequency Interference) and so protect modern vehicles electronic devices, such as engine management systems, inbuilt mobile car phones, GPS systems, TV's etc, which your typical vintage scooter is probably not and never will equipped with.

A vintage scooter engine utilises what is by today's standards a relatively low-tech ignition system. This can mean the resulting reduced spark from a modern resistor type spark plug may not be sufficient to ignite all the petrol in the scooter cylinder. This will obviously create performance problems, therefore unless your scooter has been modified with an electronic ignition system, it's advisable not to use the "R" type plugs as this may see your scooter sacrificing performance and using a more petrol than it should do. There may also be other long term implications for your scooter as discussed below:

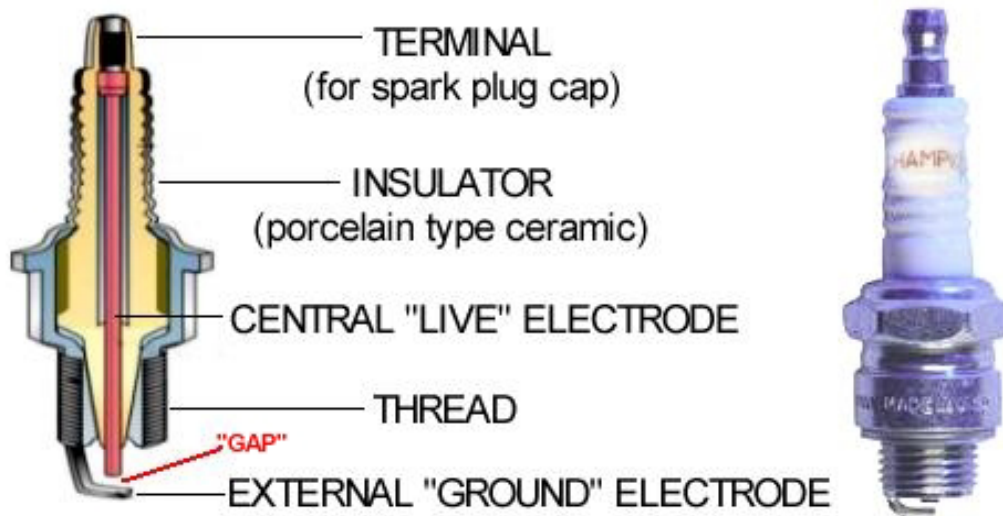
It is understandable that most sales people working at places like Super Cheap Auto are not motor mechanics, neither do many ride vintage scooters and so it's fair enough they don't have a clue about what spark plug you really need. This means a sales person will often misguidedly suggest you buy what they believe to be an "equivalent" spark plug for your vintage scooter. These usually have very similar part number to the spark plug you should be buying, but will usually have an additional letter "R" or "P" in the part number. As already said, be very wary as the "R" denotes the type of spark plug with the invisible internal resistor. Even worse are the "P" type plugs, these look almost the same as the standard spark plug and have the same thread length, however; on closer inspection it can be seen they have a longer (projected) firing tip peeking out from inside the plug thread and this effectively lengthens the amount of plug protruding into your engine cylinder. Whereas an "R" type spark plug is likely to create performance, idling, increased fuel consumption problems and even some possible engine damage after prolonged use, the "P" type will very quickly put a hole in the top of your scooters piston, so the selection of the correct plug for your scooter is of vital importance.

This vintage scooter spark plug guide has been prepared for both Lambretta and Vespa engines and includes the correct equivalent spark plugs from the two manufacturers **NGK** and **Champion**. I have included the most appropriate spark plug gaps and it should be noted that straight out of the box the spark plug gap will be around 0.7mm, which is far too big and so must be reduced (see table below for recommended spark plug gaps). I have also tried to illustrate the best type of spark plug from both manufacturers depending on the intended running conditions of the scooter, be it normal day to day street riding or longer trips on the freeway with lots of full throttle riding.

Please remember; this is a spark plug selection guide and not a bible, but it should stand you in good stead with most Vintage Lambretta and Vespa scooters. If in doubt check your scooters manual, of course the main reasons I wrote this article is that manuals for vintage scooters are rare as hens teeth and the correct selection, fitting and setting of the spark plug will have a profound effect on the performance and working life of your scooters engine.

## **BASIC ELEMENTS OF THE SPARK PLUG**

The diagrams below show the basic elements of a typical spark plug. Always handle with care, if dropped or damaged it possible to break the plugs insulator. This can result in a hairline crack that cannot be seen, but will render the spark plug totally useless.



## **NGK - SPARK PLUG DESIGNATIONS (UK & AUSTRALIA)**

**First letter (eg: B )** 14mm (this is the standard spark plug thread diameter)

**Second letter 'E'** Long reach plug

**'H'** Short reach plug

**'R'** Resistor plug for modern or electronic ignitions only

**'P'** Projected firing tip, more plug protruding into cylinder

**Third letter (If applicable)**

**'S'** High performance 'super' plug with copper electrode rather than the standard nickel/iron type.

## Spark Plug Reach

Take care when selecting the 'reach' of your spark plug, do not buy the "P" designated plugs. If the plug is too long additional plug threads are exposed inside the engines cylinder. The usual consequence of this is 'holing' your piston, in other words the top of the piston smashes into the spark plug. Even if this does not occur, what will happen is that the additional threads protruding into the cylinder will become filled with baked in carbon deposits. Then when you try and remove the contaminated spark plug it will strip the threads right out of your cylinder head.

**Protruding Tip**



**Standard Tip**

As can be seen from the two photographs above, the protruding tip type spark plug has much more of the ceramic insulator protruding below the threads. Also the metal area below the plug threads and the electrode are both longer than on a standard plug.

## SPARK PLUG HEAT RANGES

**COLD >>>>>>> HOT**

**NGK  
CHAMPION**

**N2 - N3 - N4 - N5  
B10 - B9 - B8 - B7- B6**

A 'hot' rated spark plug does not make your engine run hotter, neither does a 'cold' plug make your engine run colder, it is the engine, not the spark plug that is responsible for creating the heat. What the plug 'heat' rating actually means is that under the same operating conditions the plug itself will run hotter or colder. This is important because for an engine to operate efficiently it must reach a temperature where any accumulated carbon or combustion deposits are burned off the end of the spark plug, this is known as the "self-cleaning temperature" and which is amazingly around 450 degrees Centigrade, temperatures below this will "foul" the plug. Therefore a range of plugs have been designed to suit most riding conditions and engine temperatures; for example for short rides around town the engine may not have sufficient time to heat up to the plugs 'self cleaning temperature' therefore plugs that get hot quickly are recommended. However for long trips or those on the open road, the engine has a chance to heat up to the self cleaning temperature, so cold running plugs are recommended.

## Running too hot or cold

Be sure to select the appropriate 'heat' range for your scooter riding, because if you select a cold plug and ride around town, the plug temperature may not get hot enough and so will not reach its 'self cleaning temperature', this will mean a dirty plug with carbon deposits at the end of the plug. This may reduce the size and frequency of the sparks in your engine and so create reduced performance, poor fuel consumption and bad starting.

If you select a 'hot' plug and then do a lot of open road riding the plug temperature may become too hot, so hot that it will burn the petrol in your engine without the plug actually 'firing' (sparking), creating what is known as pre-ignition. This is bad and the heat generated can be so high it will actually melt the spark plug electrode and so result in serious engine damage, such as heat seizing and/or rapid cylinder wear.

## "READING" SPARK PLUG ELECTRODE COLOUR

It's a good idea to be able to "read" your spark plug to understand what the appearance of the firing end is telling you about your engine. The appearance mainly depends on the fuel mix and the operating temperature of the spark plug tip. There are three basic conditions for spark plugs: best, fouled and overheated. The operating range between the fouling and best spark plug temperature is called the "self-cleaning temperature", this is simply the temperature at which any accumulated carbon or combustion deposits are burned off the end of the spark plug. The colour and condition of the plug tip can tell you a lot about how your engine is operating.

In the less politically correct times of the 1960's it was often said that after 50 miles the colour of the spark plug electrode should be that of "*a dusky maiden's breast*". Let's just say another way of describing it might be the same colour as milk chocolate. See the diagrams below showing the three most often found plug conditions.

**1 - Best**



**2 - Oily**



**3 - Fouled**



### 1 – Best

Clean and the colour of a dusky maiden's breast (just right) Looks like your scooter is running just the way it was intended to.

### 2 - Oily

The black "oily" spark plug is public enemy number one of the two-stroke scooterist and is one of the main reasons for bad starting. Is your air / fuel mixture too rich, choke jammed on? Perhaps far too much oil in your two stroke mix? Try changing to a hotter rated plug.

### 3 – Fouled or dirty

Fouled with carbon and other deposits is another reason for bad starting, idling and poor performance. Are you using the right viscosity oil in your two stroke mix? Have you put additives in your fuel? Remember; a cause of fouling is the spark plug tip temperature is too cold to burn off carbon, fuel, oil or other deposits. Possibly due to a fuel mixture that is too rich, caused by not enough two stroke oil, or when using a too cold type spark plug.

## **SPARK PLUG TYPES (LAMBRETTA)**

### **SERIES I, II, III, GP, J AND LUNA RANGE**

**Champion N4 or NGK B7ES**

These are "hot" running plugs suitable for normal day to day street riding you can also use the Denso type W22 ES-U

**Champion N3 or NGK B8ES**

These are slightly cold running plugs suitable for day to day street riding with a moderately tuned up scooter engine

**Champion N2 or NGK B9ES**

These are the coldest running plugs and so are best suited for highly tuned scooters or those performing a lot of long journey full throttle freeway type riding.

### **LD AND D RANGE**

**Champion L86 or NGK B6HS**

## **SPARK PLUG TYPES (VESPA)**

### **150 SPRINT & SPORTIQUE, SPECIAL 50, PK 50, 100 & 125 PRIMAVERA 125, 150 SUPER & BAJAJ**

**Champion L86 or NGK B6HS**

These plugs are suitable for normal day to day street, rather than motorway riding

### **90 & 90SS, PRIMAVERA 125**

**Champion L81 or NGK B7HS**

These hotter running plugs are for long runs and/or motorway riding

### **RALLY 180 & 200, GS 160, SS 180, PK 80E & 80S, SS180**

**Champion N5C or NGK B6ES**

These plugs are suitable for normal day to day street, rather than motorway riding

## **FOR THE NEWER VINTAGE STYLED VESPAS**

### **PX 200**

**Champion N4C or NGK B7ES**

### **PX 200 (E Disc)**

**Champion N5C or NGK B6ES** (This hottest running plug is recommended)

### **PX 125 (electric start)**

**Champion RL4j or NGK BR7HS** (The only scooter in this guide using a resistor plug)

## SPARK PLUG GAPS

A new spark plug always has the gap set far too wide and if used without adjustment the high-voltage charge cannot arc (jump) across from the central to the external electrode as it should. Also remember the gap of any spark plug will increase over time due to normal wear. The effect is always the same, some of the fuel can remain unburned in the cylinder, resulting in power loss, poor idling and bad starting. Depending on the type of feeler gauges you are using the gap will need to be set in either an Imperial or Metric measurement as follows:

**Imperial** – From 0.020 to 0.025 of an inch (*or as my dad used to say 20 to 25 thou*)

**Metric** – From 0.5 – 0.6 of a millimeter or around “half a mill”, (*no my dad did not say it that way, as in England we had never heard of Metric in those days*).

## PLUG MAINTENANCE

The spark plug gap and colour should be checked every 1000 mile. It's always a good idea to also make sure the porcelain part of the plug (the white bit) is free from dirt and grease, otherwise the voltage to your plug cap may “track” through the grease and grime down the plugs porcelain and so no spark will occur at the plug tip.

## PLUG CAPS

Remember whenever changing your plug suppressor cap, make sure you don't get a modern one with an inbuilt resistor, that's the “R” type again. This will have the same effect as the ‘R’ type plug & give you performance problems & increase fuel consumption, that's if you ever get your engine started. Always ask for a “zero ohm” plug cap.

## CHANGING YOUR SPARK PLUG

If possible always try to change your spark plug when the engine is cold. This is because metals expand at different rates when heated. The thread on a spark plug is usually made of steel, whereas the cylinder head on your Lambretta is made of an aluminum alloy. If you change your spark plug when the engine is hot, removing it from the soft aluminum cylinder head may cause thread damage to the cylinder head. Also the tightening force you apply when screwing the plug in will change as the engine cools and so you may need to tighten the plug again. Remember to set the gap before putting in the new spark plug, the manufacturer usually sets the gap far too wide, it's a case of gently tapping the end of the plug on a hard surface to reduce the gap, until it is just right, which once again is (0.020 – 0.025” or 0.5 – 0.6 mm) for standard Lambretta Series III engines.



This is how the spark plug works inside the engine

## **A LAST WORD**

By now you should have a good idea of which spark plugs to buy and use, how to set the gap and just how important a correctly selected, fitted and working spark plug is to the performance, fuel consumption, idling, starting and longevity of your vintage scooter engine.

It is also worth remembering the petrol to oil ratio of your fuel is not only about lubricating the engine, it's also about the ratio of petrol, oil and air in your engine. Adding just a little bit of extra oil to your fuel mix can do more harm than good. This is because adding extra oil does not protect your scooter by providing extra lubrication, more oil simply means less petrol, which in turn means a leaner petrol to air ratio in your scooters cylinder. A too lean air / petrol mix causes the spark plug tip and cylinder temperature to increase, resulting in pre-ignition and other problems that are likely to quickly cause serious damage to your spark plug and engine.

Remember, maintenance is important and a stitch in time may save nine.

Happy Scootering.....

Regards  
Steve Bardsley