

The mystic world of pots



Potentiometers (short: pots) are the most common electrical parts on guitars, no matter if it's an active or passive system. In very simple words a pot is an adjustable resistor, nothing more and nothing less. With a pot you can control its resistance from zero to its mentioned value, eg. 250kOhm. Pots are normally used as a volume and tone control on a guitar. You can divide them into two different taper types, they are called "linear" and "audio" (aka "log." or "logarithmic"). In earlier days the audio pots were marked with an "A" and the linear pots with a "B" but today you can also find this system used vice versa, so the best way to identify them is to use a DMM and measure them with the taper exactly in the middle position - if both sides show the same value (exactly 50% of the pot's value) it's a linear pot, otherwise it's an audio pot. Besides the taper you can also divide them into two different groups of shafts - one group has a solid shaft (like shown in the pic above) and the other group has a splined (aka "knurled") shaft. You can put knobs for solid shaft pots on splined shaft knobs (eg. Telecaster "Dome" knobs") but not vice versa. Besides this standard pots there are a lot of special pots you can also find on guitars: pots with longer shafts (for Les Paul guitars), pots with smaller bodies, push/pull or push/push pots with a built-in switch, no load pots, reverse pots, dual taper pots, concentric pots, stereo pots

The most common values are 250k for passive single coil systems and 500k for passive humbucker systems. For active systems you need completely different values, similar to what is used in stompboxes. There are also guitars with 1Meg. pots (eg. late 60's Fender Telecasters) but nobody seems to use this value today. The value influences the tone because the pots add a little load to the complete circuit. The higher the value of the pot is, the less treble roll-off they have. That's the reason why 250k pots are common for singlecoil pickups - they have a lot of treble bite and it's not necessary to give them more, otherwise the tone can become pikey and harsh. Humbuckers don't have that much treble so 500k pots are used to not roll off more treble than necessary. The 1Meg.

pots I mentioned in combination with a Telecaster´s lead pickup produces a very trebely and harsh sounding tone and I recommend to change them with the standard 250k pots to smoothen out things a bit. The influence of the pot´s value on the tone is not that big but audible and a good field to experiment. The modern values of 220k and 470k are more or less identical to the old values and pots in general have a tolerance of up to 20%, so ;-)

If you use an audio or a linear pot for the volume control is simply a matter of taste and you have to try it on your own. The problem with pots as a passive volume control in general is that in most cases it´s not very helpful because it´s more of an on/off switch than an useable control. You have a lot of hot spots during the taper and it´s difficult to dial in the desired level because the working taper way is very, very small. Normally an audio pot is made to solve this problem and back in the good old days it was - modern audio pots normally have a ratio of 80:20 which is not very useful, older pots from the 50´s and 60´s (eg. the famous CENTRALAB audio pots) had a ratio of 70:30 or even better 60:40 which is ideal for guitar use. You can buy custom audio pots from HAMER with a very good ratio of approx. 65:35 which is very good and an excellent volume control. You can also try to get some old pots but they are vintage parts and very expensive. Or you can use a normal, modern audio pot and do a little trick to smoothen out the taper and to prevent the typical treble loss when rolling back the volume, very common in singlecoil systems. There is a complete project for this here on the webpage with all the technical details, but in short words you simply solder a 0.001uF cap with a 150k resistor in parallel between the first and the second terminal of the pot. This works great and you can experiment with the values to change the effect - changing the value of the resistor will change the way of the taper and changing the cap´s value will change the amount of treble that is saved when rolling back the level.

For the tone control you must use an audio pot to have a useable taper, please keep this in mind !

It´s possible to mix different values in one guitar, you simply have to try it out and decide what you like best.

A big problem is the horrible tolerance of the modern pots, even high-quality pots from CTS or Mouser have 20% or more. I have seen 500k pots with values of 380k up to over 700k !!!! It´s a big improvement for your tone to use matched pots with almost no tolerances. There are different ways to get those, you can buy military graded pots with almost no tolerances but it´s very difficult to get those and even if you managed to buy some, it´s hard to find the right values for guitars. There are also some technical tricks to change the value, but this is a lot of work and requires special knowledge and good skills in electronics. Or you simply buy a matched set from our webshop or any other supplier. We simply

buy large quantities of top-notch pots and measure them. So with time you get a lot of matched sets. The sound will enhance drastically with such a matched set, it´s sometimes like taken away a carpet from the amp.

So please take care of your pots :-)

**Matched sets of pots are available at the [singlecoil-webshop](http://www.singlecoil.com/shop.html)
(www.singlecoil.com/shop.html)**