

## **Metal film resistors – Carbon resistors**

There are many manuals that recommend using the better metal film resistors. Are there really so large quality differences between metal film resistors and carbon resistors ?

From my own experience I must answer this question definitely with yes.

I used a 4.7 MOhm carbon resistor as measuring resistor on an anode voltage supply card as there was no metal film resistor at hand. This was a standard type from current production (no old stock). Starting with the RoeTest4 this resistor is also responsible for regulation of the output voltage.

With this resistor the output voltage was not constant. When adjusting a high voltage (for example 300V) this voltage started drifting away a little bit after a few seconds. Not much but anyhow. I found out that the drift came from this carbon resistor. As soon as I used a metal film resistor this effect vanished.

After that I measured the resistor value with my new precision multimeter (not measurable with a low cost multimeter) and was shocked. The resistor's value changed slightly after a few seconds (heating?). But still worse: The resistor's value was not constant but drifted back and forth. There was a kind of "random noise". I tested more carbon resistors and found that same effect.

A test with a metal film resistor lead to clarity: No drifting (that is no "random noise"). The resistor's value was absolutely constant.

My conclusion is: In high grade devices carbon film resistors should not be used at all, especially if these resistors are high ohmic types. Regarding the costs a metal film resistor is about twice as expensive as a carbon resistor. But even in a device with many resistors this makes in the sum costs of some cents up to a few euros. To save money here using carbon resistors is definitely the wrong approach.