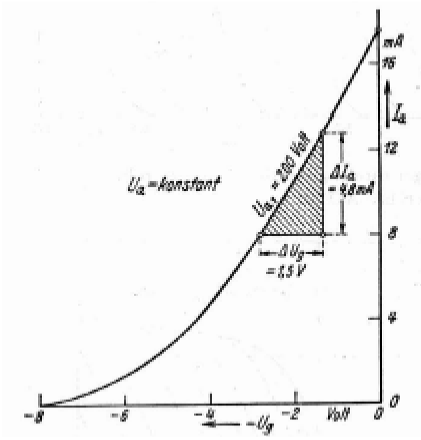
Measuring of static tube data:

When measuring the static tube data exactly those DC voltages are connected to the tube that are also present in practical operation. The manufacturers commonly supply those data in the data sheets (often called “static data” or “characteristic values”). The more exact the measuring voltages are the more exact will be the measured result. The measuring voltages therefore have to be adjusted to the correct value either automatically or by hand. Static measurement allows an exact comparison of the tube data with the manufacturer's data.
The static measuring method is the most exact method.
This method was and is also used at tube plants for final inspection. Using the static method it is not only possible to measure the currents or record characteristic curves but all other tube parameters can be determined:

Measuring the transconductance:

Two measurements are taken at the working point at slightly different G1 voltages. The transconductance is then calculated as follows:



$$\text{Transconductance} = \frac{\Delta Ia}{\Delta Ug} = \frac{Ia1-Ia2}{Ug1-Ug2}$$

Example – Measuring a Ba:

Röhrenart:	Triode
Sollwert Anode mA:	3
Messwert Anode mA:	2,7
= %:	90
Sollwert G2 mA:	
Messwert G2 mA:	
= %:	
Steilheit mA/V:	0,75
(bei Änderung G1 um .. V:)	0,4
Messw.Anode (G1 erhöht):	2,4

Ia1=2,7mA, Ia2=2,4mA, ΔUg=0,4V

$$\text{Transconductance} = \frac{2{,}7-2{,}4}{0{,}4} = 0{,}75\ \text{mA/V}$$

The specification of the transconductance only makes sense when also the measured data are given as the transconductance may vary from point to point on the characteristic curve.

I

Inverse amplification factor:

The inverse amplification factor is the measure for how many times weaker the anode voltage controls the emitted current than the grid voltage.

At a given anode voltage Ua1 (e.g. 200V) and a given negative grid voltage Ug1 a certain amount of anode current Ia will flow. When choosing a second for example 50V lower anode voltage Ua2 the anode current will decrease. Now the negative grid voltage is changed so that the original anode current flows. This grid voltage is now called Ug2. The inverse amplification factor is then calculated as follows:

$$\text{Inverse amplification factor} = \frac{Ug2-Ug1}{Ua1-Ua2} \times 100\ (\%)$$

Triodes:
This applies to triodes.

Tubes with a screen grid (Tetrodes, Pentodes):
The screen effect of the screen grid provokes that a change of the anode voltage has only very little effect on the anode current. The influence tends to be 0. There is a much larger influence due to the distribution of anode and screen grid current value. Therefore it is not meaningful to calculate the inverse amplification factor for tubes with a screen grid. It is more meaningful to calculate the inverse amplification of the screen grid but that is also a more or less theoretical result (change of current distribution). See also Barkhausen or Kammerloher.

Amplification factor:

This is the inverse of the inverse amplification factor and so just another presentation:

$$\mu = \frac{1}{D}$$

Internal resistance:

The voltages are adjusted according to the data sheet. At an anode voltage Ua1 and a negative grid voltage Ug there will flow an anode current Ia1. At a lower anode voltage Ua2 and the same grid voltage Ug an anode current Ia2 will flow. The internal resistance of the tube is then calculated as follows:

$$Ri = \frac{Ua1-Ua2}{Ia1-Ia2} \times 1000 \text{ (Ohm, if Ia is given in mA)}$$

Tubes with screen grid: Here the same applies as already stated for the inverse amplification calculation: Calculation of the inner resistance has to be taken with a pinch of salt (change of current distribution).