Non-linear resistors

Student Group

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Nonlinear resistors

All resistors examined so far are linear resistors, for which the characteristic curve $I=f(U)$ is a straight line, s. figure 1. The resistance value of a linear resistor is independent of the current I flowing through it or the applied voltage U.

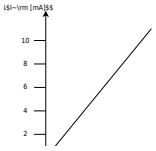

Fig. 1: Characteristic curve of a linear resistor

With nonlinear resistors, there is no proportionality between current and voltage. The characteristic curve of such a resistor is shown in figure 2. With these resistors, we talk about static resistance (R) and dynamic (or differential) resistance (r). The static resistance is determined for a specific operating point: at a specific voltage, the current is read from the resistance characteristic curve. The calculation is performed according to Ohm's law:

$$ R = \frac{U}{I} $$

The differential resistance around the operating point is calculated from the current difference caused by a change in the applied voltage:

$$ r = \frac{\Delta U}{\Delta I} $$

Fig. 2: Characteristic curve of a nonlinear resistor

A light bulb is examined as an example of a nonlinear resistor. Set up the measuring circuit shown in figure 3.

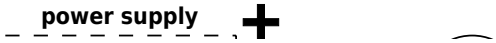

Fig. 3: Measuring circuit light bulb

Set the voltage on the power supply to the voltage values from table 1. Measure the corresponding current values and enter them in table 1.

U [V]	0,5	1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0
I [mA]									

Tab. 1: Values characteristic curve light bulb

Create the characteristic curve $I = f(U)$, s. figure ##

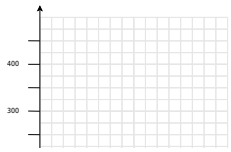

Fig. ##: Characteristic curve light bulb

Calculate the static resistance R at the operating point $U = \rm 7.0 ~V$:

Calculate the dynamic resistance r at the operating point $U = \rm 7.0 ~V$:

Compare the values with the values from table ## (direct resistance measurement)

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