

Phenomena of electrical conduction
Conduction phenomena in a vacuum

Characteristic of a valve diode

Object of the experiment

1. Recording the characteristic of a tube diode

Setup



Safety notes:

During operation, hazardous contact voltages are applied to the diode!

The demonstration diode can be destroyed by incorrect connection and by voltages and currents that are too high. Regarding the connection and technical data heed the instruction sheet 555 610.

Apparatus

1 Demonstration diode	555 610
1 Tube stand	555 600
2 Demo multimeters, passive	531 906
1 Tube power supply, 0...500 V	521 65
4 Safety connecting leads, 100 cm, red.....	500 641
3 Safety connecting leads, 100 cm, blue.....	500 642

Carrying out the experiment

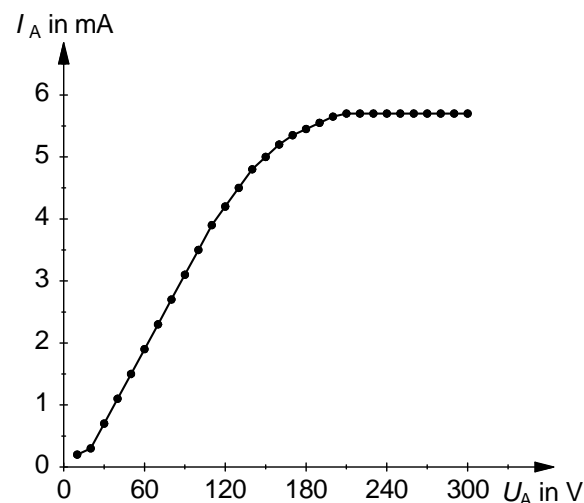
- Switch the tube power supply on, and adjust a heating voltage U_F of approx. 6.5 V with the potentiometer.
- Apply an anode voltage U_A of 10 V between the cathode and the anode (cathode -, anode +).
- Read the anode current I_A from the multimeter, and enter it in the table.
- Repeat the measurement in steps of 10 V up to an anode voltage of 300 V.

Measuring example

$$U_F = 6.5 \text{ V}$$

U_A in V	I_A in mA	U_A in V	I_A in mA
10	0.2	160	5.2
20	0.3	170	5.3
30	0.7	180	5.4
40	1.1	190	5.5
50	1.5	200	5.6
60	1.9	210	5.7
70	2.3	220	5.7
80	2.7	230	5.8
90	3.1	240	5.7
100	3.5	250	5.7
110	3.9	260	5.7
120	4.2	270	5.7
130	4.5	280	5.8
140	4.8	290	5.7
150	5.0	300	5.7

Evaluation



Due to thermionic emission, electrons escape from the hot cathode of the tube.

The electrons are accelerated in the electric field between the cathode and the anode, which leads to an anode current I_A .

If the anode voltage U_A is enhanced, the number of electrons which reach the anode increases, whereby the anode current I_A is increased.

At an anode voltage U_A of approx. 210 V, all electrons that escape from the hot cathode at the heating voltage U_F reach the anode. The anode current I_A has reached its saturation value and remains constant.

Remark:

If additional characteristics are recorded at other temperatures, it can be demonstrated that the saturation value depends on the number of charge carriers escaping from the hot cathode.