Claims

1. Ionization device (12), comprising:
   an ionization space (10) formed in a chamber (11),
   an inlet system (6) for supplying a gas (2) to be ionized to the ionization space (10),
   an electron source (14) having at least one filament (15a,b) for supply of an electron beam (19a) to the ionization space (10), and
   an outlet system (13) for letting the ionized gas (2a) out of the ionization space (10),
   an electron optics (16a,b) comprising at least two electrodes (17a-c, 18a-c) is installed between the filament (15a,b) and the ionization space (10) and characterized in that the electron optics (16a,b) is configured to measure an emission current (I_F) of the filament (15a,b) at at least one electrode (17b, 18b).

2. Ionization device according to Claim 1, in which the electron optics (16a,b) is designed to focus the electron beam (19a) into the ionization space (10).

3. Ionization device according to Claim 1 or 2, further comprising: a control device (8) for controlling the emission current (I_F) of the filament (15a,b) to a target emission current ($I_{F,S}$).

4. Ionization device according to any of the preceding claims, in which the electron optics (16a,b) has at least one switchable electrode (17c, 18c) for deflecting the electron beam (19a) away from an opening (20a, 20b) in the container (11).

5. Ionization device according to any of the preceding claims, in which the filament (15a,b) is disposed at a distance (A) of at least 0.5 cm, preferably of at least 3 cm, in particular of at least 5 cm, from the chamber (11).

6 Ionization device according to any of the preceding claims, in which the electron source (14) comprises two or more filaments (15a,b) that each serve to supply one electron beam (19a) through opposing openings (20a, 20b) of the chamber (11).

7. Ionization device according to any of the preceding claims, designed to generate a pressure (p) of more than 10^{-4} mbar and not more than 1 mbar in the ionization space (10).

8. Ionization device according to any of the preceding claims, in which a flow conductance (C_E) of the inlet system (6) is greater than a flow conductance (C_A) of the outlet system (13).

9. Ionization device according to the preamble of Claim 1, especially according to any of the preceding claims, having a vacuum generation device (21) configured to generate a pressure (p_F) at the filament (15a,b) of the electron source (12) that is lower than a pressure (p) in the ionization space (10).

10. Ionization device according to Claim 9, configured to generate a pressure (p_F) between 10^{-8} mbar and 10^{-4} mbar at the filament (15a,b).

11. Mass spectrometer (1) for mass-spectrometric analysis of a gas (2) comprising: an ionization device (12) according to any of the preceding claims, and
a detector (24) for detection of the gas (2a) to be analysed that has been ionized in the ionization device (12).