

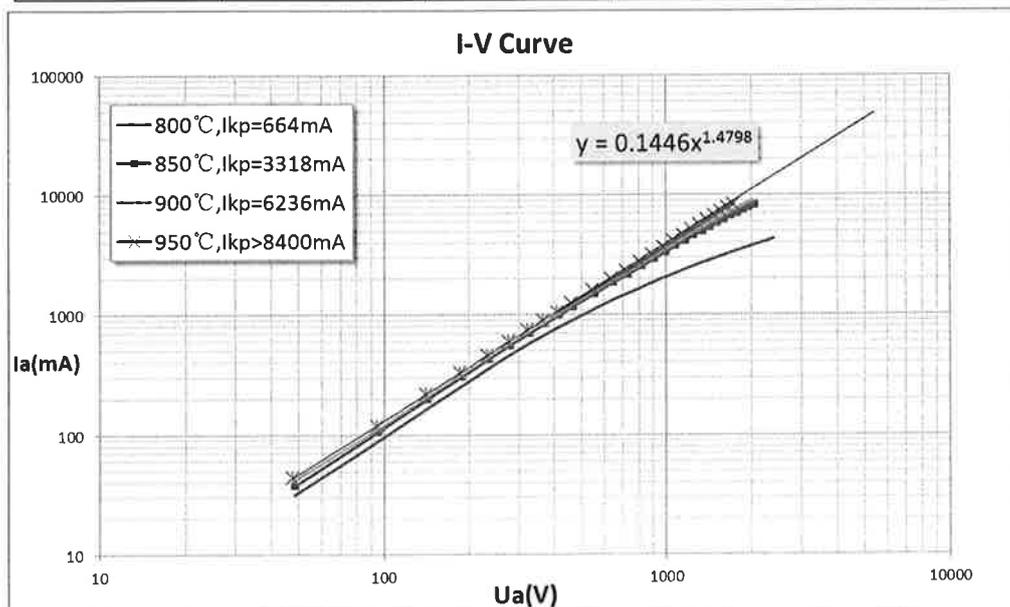
OPERATING INSTRUCTION

- 1) The following table shows the voltage and current of heater when the temperature of two cathodes surface is 1000°C and 1150°C during the pretreatment in the glass bulb, respectively. the cathode is fixed to nickel rod with the Tantalum belt, there is no any heat shield around the cathode, so heat radiation loss occurs very strong. The results have a little difference with that in the gun. The temperature will be 30°C lower than it in the gun.

No.6121#		
Temperature (°C _B)	1000	1150
Voltage (V)	8.90	11.88
Current (A)	8.37	10.21
No.6122#		
Temperature (°C _B)	1000	1150
Voltage (V)	8.40	11.22
Current (A)	8.07	9.92

- 2) The next table shows the test results of the cathode as a reference (same structure and same process) .The cathode is tested in a metal vacuum chamber, P=3.0E-6Pa, the support structure is same with that in a glass bulb. According to these results, if you want to get 5A total current, the appropriate temperature is about 900°C, and the voltage of the heater is about 6.87V. the power dissipation is about 44W.

Voltage of Heater (V)	Current of Heater (A)	Temperature (°C _B)	Knee Point of I-V Curve J _{kp} (A/cm ²)	Knee Point of I-V Curve I _{kp} (mA)
5.67	5.55	800	0.44	664
6.39	6.09	850	2.2	3318.
6.87	6.38	900	4.1	6236
7.84	7.03	950	>5.6	>8400



- 3) The two cathodes have been outgassed by pretreatment. They are vacuum sealed in two glass bulbs. Before assembling the cathode in a gun, remove the cathode after breaking the glass bulb gently. The cathode must be exposed to dry and cool atmosphere (relative humidity $\leq 50\%$ and temperature $\leq 25^\circ\text{C}$). While connecting the leg of heater to a metal belt or a metal rod, please don't fold the legs, the legs of the heater could be bend up to 5mm if keeping the root of leg stable. The wire is a bit fragile after pretreatment at elevated temperature.
- 4) During the first Operation, the cathode need to outgas through slowly raising heater voltage until cathode temperature reach 1000°C while monitoring the pressure. The pressure near the cathode should be lower than $2.0\text{E-}5\text{Pa}$. It usually takes 6~12 hours to heat the cathode to high temperature depending on the outgassing of the circumambient parts near the cathode and the volume of the vacuum system. The outgassing rate of the cathode itself is very low. Then raising the temperature of the cathode assembly to $1150\pm 20^\circ\text{C}$ and hold 10-30 minutes while monitoring the electron emission. Cathode electron emission is the best indicator of activation. Cathode activation is also possible at lower temperatures($950\text{-}1100^\circ\text{C}$) but it will take a long time.