

Service Guide for XUGUANG Electron Tubes

1 Usage and Maintenance

1.1 The electron tubes should be vertically placed and transported in original packages. Meanwhile, these packages should be carefully handled and kept from rains, strikes, violent shaking or turnover.

1.2 The electron tubes should be placed in dry and clean place under -5°C to $+45^{\circ}\text{C}$, $\text{RH}\leq 80\%$ circumstances and kept far from corrosive materials. The Package containing the tube should be kept upright. Any turnover or strike is forbidden. Otherwise, the electron tube should be enveloped in plastic bags with dryer for long-term storage.

1.3 The electron tubes, specifically for the ceramic envelope, should be kept against contaminations; meanwhile, it is never allowed to engrave or mark on ceramic surface, which may badly decrease the dielectric strength.

1.4 The product should be thoroughly inspected before installation to check if there is any physical damage or deformation to ceramic envelope and metal parts; then, a multimeter will be used to test the continuity of the filament while a 2500V megohm meter should be applied to test the resistance between grids and cathode.

1.5 Prior to installing or replacing a tube, it is strongly recommended to inspect the socket to determine if there is any break or loss of finger stock. Broken pieces of finger stock should be repaired before installation. Then the tube are vertically placed and inserted into the socket and then slightly rotated so that the grid rings are in good contact with the finger stock. If the tube is installed into the equipment by bolted or clamped connections, spanners would be used so that the tube bears no torque force. The terminal connected to the filament should avoid from overheating during in operation.

1.6 The cooling system needs to begin operating before the tube is empowered. Nevertheless, the cooling system should be kept working for another 10 minutes even all the voltages are cut off.

1.7 If the products are brand new or have been stored in warehouse for a long period, they should go through voltage conditioning before application. The method is stipulated as followed: 50% of the rated voltage is applied to filament and held for 10~15 minutes and then changed to 100% and held for another 30 minutes. At normal condition, if there occurs overvoltage or overcurrent, the anode voltage and grid voltage are supposed to be reduced to 50-80% and held for 30-60minutes.

1.8 The filament voltage should be successively added to rated value and the starting current is no more than 1.5 times of the rated value. It is requested that the voltage can only fluctuate within 2%.

1.9 Before operation, tubes should be warmed up for 10-20 minutes. The warm-up time should be prolonged if the products need to operate in humid condition or have been stored for a very long period. It should be noted that all parameters should not exceed limits during operation at any time. The temperature between ceramic envelope and metal parts should be controlled with 250°C.

1.10 Either the water circulation cooling jackets or the forced air cooling blades need to be inspected and cleaned periodically so that they might not be choked by deposits or dusts. Nevertheless, when tubes have to operate at high altitudes or temperature, air flow should be appropriately strengthened and increased.

2 Unpacking and Inspecting

2.1 Unpacking

Tubes should be taken out by hands in gloves through lifting the anode flange, rather than taking these fragile positions such as ceramic envelope, sealing parts and argon welding edges, which are desperately vulnerable. When tubes are lifted out, they should be placed on deliberately designed shelves so as not to damage these fragile parts.

2.2 Inspection

While unpacking, operators should inspect very carefully if there is any crack on ceramic envelope or distortion of metal parts. Then 1000V or 5000V Megohm Meter is applied to test the continuity of the filament is broken and the insulating condition of every grids to cathode and to each other. The interelectrode resistance should meet up with the specifications written on the instructions. If AC high voltage equipment is available, the withstand voltage test should be done and the test results should satisfy the specifications as well.

3 Notes

3.1 The products are not allowed to operate beyond the limits of parameters and it is unacceptable that two or more parameters simultaneously reach to limits.

3.2 It is a wise decision that that the tubes are stored in original packing. If unpacked, the products should be vertically placed in shelves so that the stem is unstressed.

3.3 A service report should be carefully fulfilled in strict accordance with the certificate of quality before the electron tube is installed. The service report together with the certificate of quality should be then carefully maintained and returned to us with the product packed in original packing if there is any quality problem in warranty period.

4 Warning

4.1 Limited Warranty Scope: In principle, XUGUANG has no responsibility to so-called quality problem of any product which has been sold out for three years.

4.2 If the product fails to operate within its warranty life time, it will be proportionally charged according to the actual service time. That is, if the actual service time is less than 10% of the warranty life time, the failed tube should be not replaced by new one for free; in contrast, if the actual service time is over 80% of the warranty life time, no compensation will be reimbursed. Charges will be calculated according to the formula as followed:

$$\text{Charges} = \frac{\text{The actual Service time}}{\text{The Warranty life time}} \times \text{Price}$$

5 Transportation and Storage

5.1 Transportation

When the products need to be transported by vehicles of variety, it is very necessary that they are packed in original packing and vertically placed on the vehicles. Otherwise, the packages should be kept from moisture, strikes, violent shake or turnover.

5.2 Products should be maintained in dry and clean warehouses under -5°C to +45°C, RH≤80% circumstances and safe from corrosive materials, dust or moisture.

6 Installation and Operation

6.1 Installation

6.1.1 Before installation, dust should be cleared off the products. Precautions should be paid as well to minimize the possibility of failure of insulation caused by strike or scratch on the surface of ceramic envelope. Otherwise, it is never allowed to write on or touch any portion of the ceramic envelope or any contact surface (This applies to these products which are determined to be returned back to the manufacturer because of quality problem); and the socket must be inspected before installation to check if the finger stock are badly distorted or inflexible. If so, the socket or the broken fingers should be repaired or replaced prior to installation of the tube. In addition, dust or materials fallen into the socket should be removed as well.

6.1.2 Adequate contact pressure is necessary for proper operation and long life. As the tube is inserted into the socket, it is important to ensure that the tube will not rotate in circumference direction or suffer from any contamination or scratch. Besides, the tube is not allowed to be connected with the equipment by welding and the cooling system is not subject to frequent removal.

6.1.3 Prior to installing a tube, a Megohm meter is applied to determine if the tube shows a break or a short circuit between the filament and other

electrodes. When it is accessible, it is wise to remove particles through cold voltage conditioning in case of sparks when it begins to operate.

6.1.4 While in operation, it should be cautioned that the grid contact rings are in good contact with the pins of the socket; otherwise, partial discharge will occur and cause breakdown and failure of the tube.

6.2 Operation

6.2.1 Sequence of Operating

After the product is well installed, the cooling system is initiated first and then voltages are added to the electrodes. The sequence of voltage connecting is as followed: filament voltage → control grid (grid No. 1) voltage → anode voltage → Screen grid (Grid No. 2) voltage → excitation voltage. The filament, however, should be warmed up for a certain period before the control grid is powered.

If it requires turning off the equipment, the sequence of disconnecting is just opposite to the connecting sequence. Yet the cooling system has to last for another 15 minutes even the filament voltage is cut off.

6.2.2 Cautions to filament voltage

Specifically for high power frequency electron tubes, repeated attempts to restart the equipment will accelerate distortion of the cathode and reduce the tube's life. Thus, when the equipment has to be interrupted periodically, it is suggested that the filament always maintain half working state at the voltage 2V while the cooling system is turned off.

6.2.3 Conditioning

If the tube is newly received or has been stored for a long period, two hours of filament voltage conditioning at rating value is required. When it is accessible, it is better to complete the conditioning process at a very low output power frequency.