

Jingguang 4CX3500A

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Radial Beam Power Tetrode



The jingguang™ 4CX3500A is designed for audio and radio frequency applications. It features an improved anode-to-screen-grid ceramic envelope which eliminates the cracking problem traditional with 4CX3500A's manufactured in the United States. The jingguang 4CX3500A has a directly-heated thoriated tungsten mesh filament for mechanical ruggedness and good VHF electrical performance. The jingguang 4CX3500A is manufactured in the Jiangxi Jingguang Electronics Co.,Ltd, and is designed to be directly interchangeable with the 4CX3500A manufactured in the United States.

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General Characteristics

Electrical

<i>Filament:</i>	<i>Thoriated tungsten mesh</i>
<i>Voltage</i>	<i>5.0 ± 0.25V</i>
<i>Current, at 5.0 Volts</i>	<i>90</i>
<i>Amplification factor (average):</i>	
<i>Grid to screen</i>	<i>4.5</i>
<i>Direct interelectrode capacitances (grounded cathode):</i>	
<i>Cin</i>	<i>115 pF</i>
<i>Cout</i>	<i>15.6 pF</i>
<i>Cgp</i>	<i>0.63 pF</i>
<i>Direct interelectrode capacitances (grids grounded):</i>	
<i>Cin</i>	<i>63.8 pF</i>
<i>Cout</i>	<i>16.2 pF</i>
<i>Cpk</i>	<i>0.06 pF</i>
<i>Maximum frequency for full ratings (CW)</i>	<i>220 MHz</i>

Mechanical

<i>Maximum overall dimensions:</i>	
<i>Length</i>	<i>184.2 mm (7.25 in.)</i>
<i>Diameter</i>	<i>125.5 mm (4.94 in.)</i>
<i>Net weight*</i>	<i>2.5 kg (5.5 lb)</i>
<i>Operating position</i>	<i>Axis vertical, base up or down</i>
<i>Maximum operating temperature, ceramic/metal seals or envelope</i>	<i>250° C</i>
<i>Cooling</i>	<i>Forced air</i>
<i>Base</i>	<i>Coaxial, designed for use with SK340 (HF) or SK350 (VHF) sockets</i>
<i>Recommended chimney</i>	<i>SK306 (HF) or SK356 (VHF)</i>
<i>Anode connector</i>	<i>Svetlana AC-3</i>

Radio Frequency Power Amplifier Class C FM or Telegraphy

Absolute maximum ratings

<i>DC plate voltage</i>	<i>6000 V</i>
<i>DC screen voltage</i>	<i>1500 V</i>
<i>DC grid voltage</i>	<i>-500 V</i>
<i>DC plate current</i>	<i>2.0 A</i>
<i>Plate dissipation</i>	<i>3500 W</i>
<i>Screen dissipation</i>	<i>165 W</i>
<i>Grid dissipation</i>	<i>50 W</i>

Typical Operation

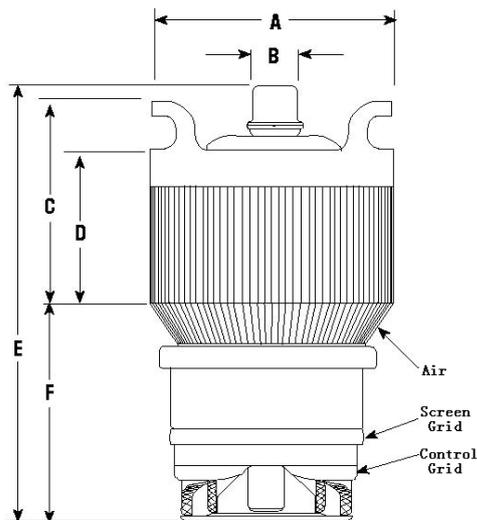
(Frequencies to 100.5 MHz)

<i>DC plate voltage</i>	<i>4000</i>	<i>4300</i>	<i>V</i>
<i>DC screen voltage</i>	<i>500</i>	<i>700</i>	<i>V</i>
<i>DC grid voltage</i>	<i>-300</i>	<i>-400</i>	<i>V</i>
<i>DC plate current</i>	<i>1.5</i>	<i>1.9</i>	<i>A</i>
<i>DC screen current*</i>	<i>140</i>	<i>123</i>	<i>mA</i>
<i>DC grid current*</i>	<i>84</i>	<i>63</i>	<i>mA</i>
<i>Driving power</i>	<i>56</i>	<i>66</i>	<i>W</i>
<i>Useful output power</i>	<i>3800</i>	<i>5500</i>	<i>W</i>

Approximate values

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Dimensional Data				
Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	122	125	4.80	4.94
B	21.7	22.7	0.855	0.895
C	64.2	73.7	2.52	2.90
D	38.8	48.3	1.52	1.90
E	176	182	6.93	7.17
F	88.2	97.7	3.47	3.85

Electrical Application

Plate operation The rated maximum plate dissipation of the 4CX3500A is 3500 Watts. This power may be safely sustained with adequate air cooling. The tube must be protected from damage which may be caused by an internal arc occurring at high plate voltage. A protective resistance should always be connected in series with each tube anode to help absorb power-supply stored energy if an internal arc should occur.

Control-grid operation The maximum control grid dissipation is 50 Watts, determined (approximately) by the product of the dc grid current and the peak positive grid voltage.

Screen-grid operation The maximum screen grid dissipation is 165 Watts. With no ac applied to the screen grid, dissipation is the product of dc screen voltage and the dc screen current. Plate voltage, plate loading or bias voltage must never be removed while filament and screen voltages are present.

Filament operation Svetlana recommends that a new tube, or a tube which has been in storage for some period of time, be operated with only filament voltage applied for a period of from 30 to 60 minutes before full operation begins. Once normal operation has been established, a minimum filament warm-up time of four to five seconds is sufficient for full filament emission. Filament voltage should be measured at the socket.

At rated nominal filament voltage, the peak emission capability of the tube is many times that needed for communication service. A reduction in filament voltage will lower the filament temperature, and this reduction will substantially increase life expectancy. The correct value of filament voltage should be determined for the particular applications. Jingguang recommends that the tube be operated at full nominal voltage for an initial stabilization period of 100 to 200 hours before any action is taken to operate at reduced voltage. The voltage should gradually be reduced until there is a slight degradation in performance— such as power output or distortion. The voltage should then be increased a few tenths of a Volt above the value where performance degradation was first noted. The operating point should be rechecked after 24 hours.

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Mechanical Application

Mounting The Jingguang 4CX3500A must be mounted vertically, base up or down. The tube should be protected from vibration and shock.

Storage If the 4CX3500A is to be stored as a spare, it should be kept in its original packaging to minimize the possibility of handling damage.

Cooling The 4CX3500A requires forced-air cooling in all applications. The tube socket should be mounted in a pressurized compartment so that the cooling air passes through the socket and is guided to the anode cooling fins by an air chimney. If cooling air is not passed around the base of the tube and through the socket, arrangements must be made to assure adequate cooling of the tube base and socket contacts. An air interlock system should be provided to remove all voltages from the tube for partial or full failure of the air system.

Adequate movement of cooling air around the base of the tube keeps the tube base and the socket contact fingers at safe operating temperatures.

Although the maximum temperature rating for seals and the anode core is 250° C, good engineering practice requires that a safety factor be allowed. The table shows cooling parameters with the cooling air at 50° C and maximum tube anode temperature of 225° C. The figures are for the tube with air passing in a base-to-anode direction. Pressure drop values shown are approximate and are for the appropriate tube/socket/chimney combination

Minimum Cooling Air-Flow Requirements

Sea Level		
Plate dissipation (Watts)	Air flow (CFM)	Pressure drop (Inches of water)
3500	241	1.9

At altitudes significantly above sea level, the flow rate must be increased for equivalent cooling. At 5,000 feet above sea level, both the flow rate and the pressure drop should be increased by a factor of 1.20, while at 10,000 feet both flow rate and pressure drop must be increased by 1.46.

Special applications If the user needs to operate this tube under conditions widely different from those given in this publication, contact any location of Svetlana Electron Devices for technical assistance.

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