Svetlana 4CX5000A/8170 Radial Beam Power Tetrode

The Svetlana™ 4CX5000A/8170 is designed for audio and radio frequency applications. It is particularly well-suited for use in VHF FM broadcast transmitters in the Band II 88-108 MHz frequency range. The Svetlana 4CX5000A/8170 has a directly-heated thoriated tungsten mesh filament for mechanical ruggedness and good VHF electrical performance. This modern mesh filament design is superior to the old hairpin design of the 1950's. In some VHF applications, the input circuit may need minor tuning to use the Svetlana 4CX5000A/8170 as a replacement because of the low inductance of the Svetlana mesh filament. No adjustments are required in Audio, MF or HF equipment.

The Svetlana 4CX5000A/8170 is manufactured in the Svetlana factory in St. Petersburg, Russia, and is designed to be a direct replacement for the 4CX5000A/8170 manufactured in the United States, England and elsewhere.

Svetlana
ELECTRON DEVICES

Svetlana 4CX5000A/8170

General Characteristics

Electrical

Filament:	*Thoriated tungsten mesh*
Voltage	*7.5 ± 0.37V*
Current, at 7.5 Volts	*75A*
Amplification factor (average):	
Grid to screen	*4.5*
Direct interelectrode capacitances (grounded filament):	
Cin	*122 pF*
Cout	*23 pF*
Cgp	*1.0 pF*
Direct interelectrode capacitances (grounded grid):	
Cin	*58 pF*
Cout	*23 pF*
Cpk	*0.16 pF*
Maximum frequency for full ratings (CW)	*110 MHz*

Mechanical

Maximum overall dimensions:	
Length	*23.18 cm (9.13 in.)*
Diameter	*12.54 cm (4.94 in.)*
Net weight	*4.3 kg (9.5 lb)*
Operating position	*Axis vertical, base up or down*
Maximum operating temperature, ceramic/metal seals or envelope	*250° C*
Cooling	*Forced air*
Base	*Coaxial, designed for use with SK300 series sockets*
Chimney	*SK306 or SK356*
Anode connector	*Svetlana AC-3*

Radio Frequency Power Amplifier Class C FM

Absolute maximum ratings

DC plate voltage	*7500*	*V*
DC screen voltage	*1500*	*V*
DC grid voltage	*-500*	*V*
DC plate current	*3.0*	*A*
Plate dissipation	*5*	*kW*
Screen dissipation	*250*	*W*
Grid dissipation	*75*	*W*

Typical Operation

(Frequencies to 110 MHz)		
DC plate voltage	*6500*	*V*
DC screen voltage	*750*	*V*
DC grid voltage	*-350*	*V*
DC plate current	*2.3*	*A*
*DC screen current**	*0.2*	*A*
*DC grid current**	*0.05*	*A*
Measured driving power	*100*	*W*
Useful output power	*10*	*kW*

** Approximate values*

Radial Beam Power Tetrode

Plate Modulated RF Power Amplifier, Grid Driven, Class C Telephony - Carrier Conditions

Absolute maximum ratings		
DC plate voltage	*5500*	*V*
DC screen voltage	*1000*	*V*
DC grid voltage	*-500*	*V*
DC plate current	*2.5*	*A*
Plate dissipation	*3.5*	*kW*
Screen dissipation	*250*	*W*
Grid dissipation	*75*	*W*
Typical Operation		
DC plate voltage	*5000*	*V*
DC screen voltage	*500*	*V*
Peak AF screen voltage (100% mod.)	*450*	*V*
DC grid bias voltage	*-400*	*V*
DC plate current	*1.4*	*A*
*DC screen current**	*0.26*	*A*
*DC grid current**	*0.05*	*A*
*Peak rf grid voltage**	*520*	*V*
Grid driving power (calculated)	*25*	*W*
Plate dissipation	*1100*	*W*
Plate output power	*5800*	*W*

Audio Frequency Power Amplifier or Modulator, Grid Driven, Class AB_1

Absolute maximum ratings			
DC plate voltage		*7500*	*V*
DC screen voltage		*1500*	*V*
DC plate current		*4.0*	*A*
Plate dissipation		*6000*	*W*
Screen dissipation		*250*	*W*
Grid dissipation		*75*	*W*
Typical Operation (two tubes, sinusoidal waveform)			
DC plate voltage	*5000*	*7000*	*V*
DC screen voltage	*1250*	*1250*	*V*
*DC grid voltage***	*-280*	*-325*	*V*
Zero-signal plate current	*1.0*	*0.70*	*A*
Maximum signal plate current	*4.40*	*3.65*	*A*
*Maximum signal screen current**	*0.33*	*0.24*	*A*
Peak AF grid voltage	*240*	*235*	*V*
Driving power	*0*	*0*	*W*
Load resistance plate-to-plate	*2370*	*4100*	*Ohms*
Maximum signal plate dissipation	*4200*	*4200*	*W*
Plate output power	*13.5*	*17.5*	*kW*

** Approximate values ** Adjust for specified zero-signal plate current*

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RF Linear Amplifier, Grid Driven, Class- AB_1

Absolute Maximum Ratings		
DC plate voltage	*7500*	*V*
DC screen voltage	*1600*	*V*
DC plate current	*4.0*	*A*
Plate dissipation	*6000*	*W*
Screen dissipation	*250*	*W*
Grid dissipation	*75*	*W*
Typical Operation *(Frequencies to 110 MHz)*		
DC plate voltage	*7500*	*V*
DC screen voltage	*1250*	*V*
*DC grid voltage***	*-300*	*V*
Zero-signal DC plate current	*0.5*	*A*
Single-tone DC plate current	*1.90*	*A*
*Single-tone DC screen current**	*0.20*	*A*
*Peak RF grid voltage**	*300*	*V*
Plate dissipation	*4200*	*W*
Single-tone plate output power	*10*	*kW*

** Approximate values ** Adjust for specified zero-signal plate current*

Electrical Application

Plate operation The rated maximum plate dissipation of the tube for class AB applications is 6 kilowatts. 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 75 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 250 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 application. Svetlana 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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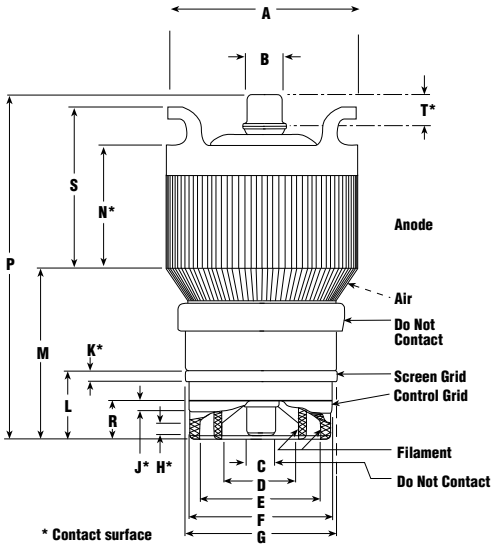
Svetlana 4CX5000A/8170 Outline Drawing



Mechanical Application

Mounting The Svetlana 4CX5000A/8170 must be mounted vertically, base up or down. The tube should be protected from vibration and shock.

Storage If the 4CX5000A/8170 is to be stored as a spare, it should be kept in its original packaging to minimize the possibility of handling damage.

Cooling The 4CX5000A/8170 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.

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 200° 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 tube/socket/chimney combination.

Dimensional Data

Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	122.22	125.43	4.812	4.938
B	21.72	22.73	0.855	0.895
C	18.29	19.30	0.720	0.760
D	48.16	49.17	1.896	1.936
E	79.58	80.59	3.133	3.173
F	96.32	97.33	3.792	3.832
G	101.09	102.11	3.980	4.020
H	4.78	—	0.188	—
J	4.78	—	0.188	—
K	4.78	—	0.188	—
L	44.81	46.38	1.764	1.826
M	106.38	115.90	4.188	4.563
N	73.03	82.55	2.875	3.250
P	219.08	231.78	8.625	9.125
R	25.04	26.67	0.986	1.050
S	98.43	107.95	3.875	4.250
T	9.53	—	0.375	—

Minimum Cooling Air-Flow Requirements

Sea Level

Plate dissipation (Watts)	Air flow (CFM)	Pressure drop (Inches of water)
2000	75	0.4
4000	145	1.1
6000	230	2.0

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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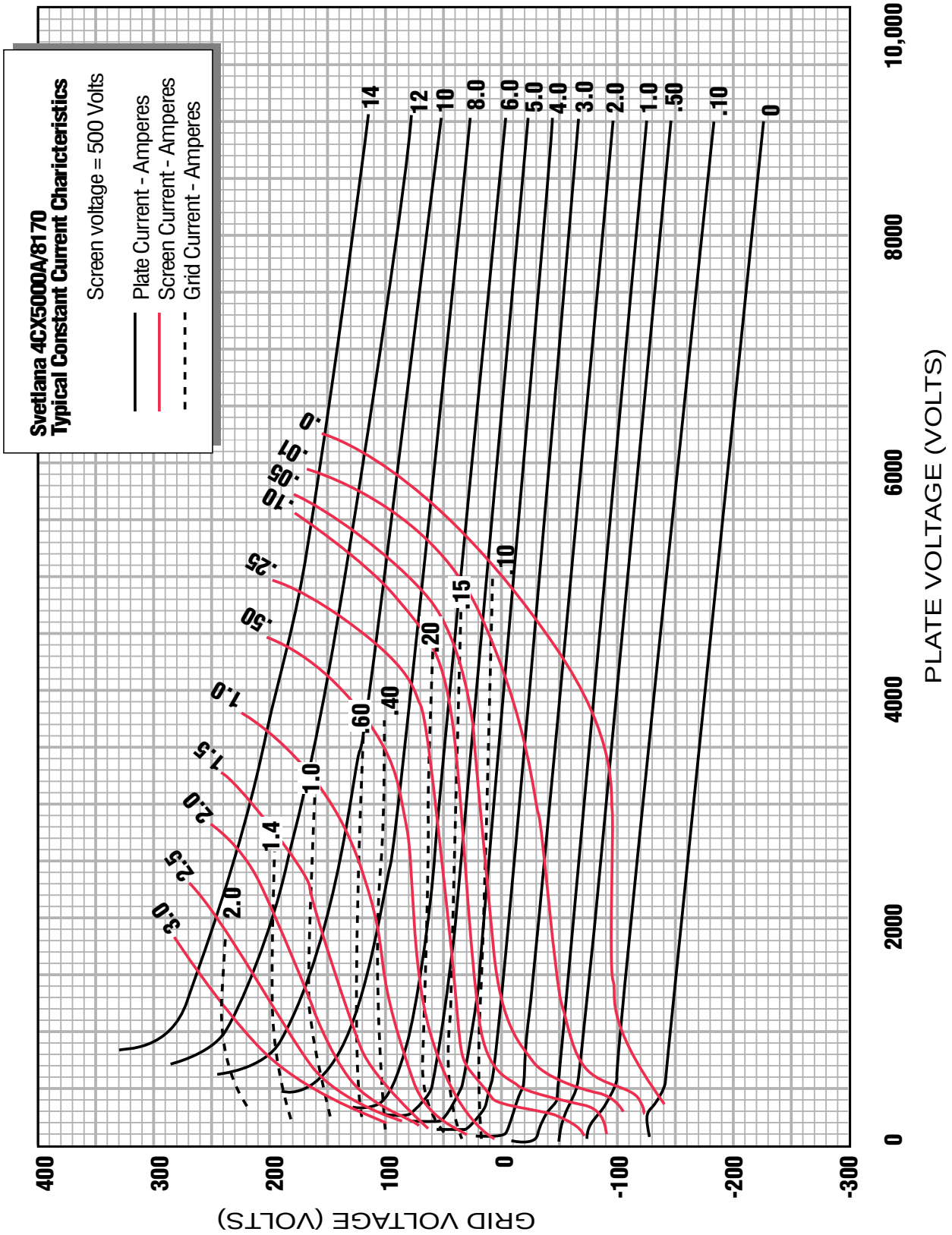

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