

SVETLANA TECHNICAL DATA

4CX400A

Radial Beam Power Tetrode



The Svetlana 4CX400A is a compact, high-perveance radial beam tetrode having a plate dissipation rating of 400 Watts. Because of the unique internal geometry of the Svetlana 4CX400A, the tube will operate at low plate voltage with high efficiency. This advantage is possible through the use of an electron trapping configuration which reduces secondary emission.

Characteristics

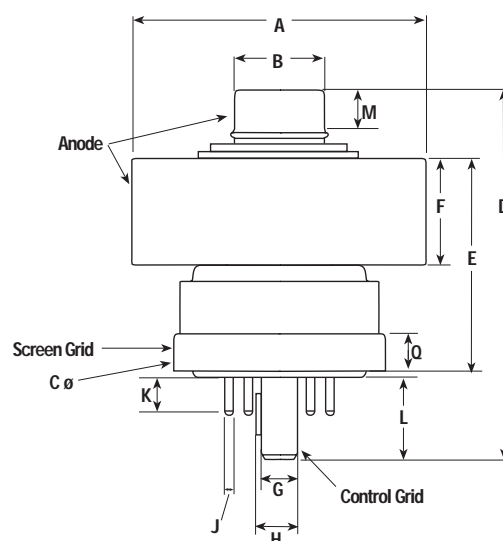
Electrical

Heater	Min.	Nom.	Max.	
Voltage (AC or DC)	6.0	6.3	6.6	V
Current	2.95	3.15	3.335	A
Cathode	Oxide-coated, unipotential			
Cathode-to-heater potential, max.			±100	V
Transconductance ($I_b = 400$ mA, $E_b = -1000$ V, $E_{c2} = 325$ V)			26,000	μmhos
Amplification factor, grid-to-screen			6.5	
Direct interelectrode capacitances, max.				
Grounded cathode				
Input			24	pF
Output			7	pF
Feedback			0.008	pF
Maximum frequency for full ratings			500	MHz

Mechanical

Operating position	Any
Recommended socket	Svetlana SK2A or Eimac/Johnson SK-600 series
Plate connector	Svetlana AC-1
Maximum dimensions	
Height	67 mm (2.6 in.)
Diameter	51 mm (2.0 in.)
Maximum operating temperatures	
Ceramic-to-metal seals	250°C
Anode core	250°C
Cooling	Forced air
Maximum net weight	220 g (0.5 lb.)

Svetlana Outline drawing



Dimensional Data						
Dim	Millimeters			Inches		
	Min	Max	Nom	Min	Max	Nom
A	50.4	51.6	-	1.984	2.031	-
B	13.7	14.3	-	0.539	0.563	-
C	35.5	36.5	-	1.398	1.437	-
D	-	67.0	-	-	2.638	-
E	37.5	40.5	-	1.476	1.594	-
F	18.7	19.3	-	0.736	0.760	-
G	6.48	6.73	-	0.255	0.265	-
H	7.63	7.97	-	0.300	0.314	-
J	1.17	1.3	-	0.046	0.051	-
K	4.5	-	-	0.177	-	-
L	13.4	14.4	-	0.528	0.567	-
M	5.0	-	-	0.197	-	-
N	-	-	17.5	-	-	0.688
P	1.8	2.1	-	0.071	0.083	-
Q	3	-	-	0.118	-	-



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Radio Frequency Linear Amplifier Class-AB SSB operation

Maximum Ratings	CCS	ICAS	
DC plate voltage	2500	2500	V
DC screen voltage	325	400	V
DC grid voltage	-60	-60	V
DC plate current	350	410	mA
Plate dissipation	400	400	W
Screen dissipation	8	8	W
Grid dissipation	2	2	W

Typical Operation

(Peak-envelope conditions except where noted, grid driven)

DC plate voltage	2200	2500	V
DC screen voltage	325	400	V
DC grid voltage*	-30.5	-38	V
Zero-signal DC plate current	100	160	mA
Single tone DC plate current	270	400	mA
Single tone DC screen current	24	20	mA
Single tone DC grid current	0	0-2	mA
Peak rf grid voltage	30	-	V
Plate output power	405	610	W
Resonant load impedance	4800	3500	Ohms
Efficiency	68	61	%
Intermodulation distortion:			
3rd order***	-32	-30	dB
5th order***	-44	-42	dB

* Adjust to specified zero-signal dc plate current ** Approximate values

***Intermodulation distortion measured reference to one of two equal tones

Electrical Operation

Plate Operation The maximum rated plate dissipation of the Svetlana 4CX400A is 400 Watts. The tube and associated circuits should be protected in the event of an internal arc by including a series current limiting resistance in the DC lead from the power supply to the plate. Its value must be 25 Ohms or more. The resistor should be capable of withstanding the high surge current caused by an arc. It should not be used as a fuse.

Screen-Grid Operation The maximum rated power dissipation for the screen grid is 8 Watts.

The screen grid current may

reverse under certain conditions. This is a normal characteristic of most tetrodes. The screen power supply should be designed with this characteristic in mind, so that the correct operating voltage will be maintained. A current path from screen to cathode should be provided by a bleeder resistor or shunt regulator connected between screen and cathode and arranged to pass approximately 15 milliamperes per connected screen.

Cathode Operation The cathode is internally connected to the four even-numbered base pins, and all four of the corresponding socket terminals should be used to make connection to the external circuits. At radio frequencies, it is impor-

tant to keep the cathode leads short and direct and to use conductors with large areas to minimize the inductive reactances in series with the cathode leads.

Svetlana recommends that rated heater voltage be applied for a minimum of 30 seconds before other operating voltages are applied.

Where the circuit design requires the cathode and heater to be operated at different potentials, the rated maximum heater-to-cathode voltage is 100 Volts regardless of polarity.

Tube Ratings The ICAS (Intermittant Commercial and Amateur Service) ratings are for those less stringent applications in which higher power than maximum

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ratings is desired and the service is not continuous. The 4CX400A may be operated in this manner (SSB Voice application and 50% duty CW conditions) as shown in the operating data.

Linear Operation The 4CX400A may be operated in the grid driven configuration. If the input circuit consists of a DC blocked 50 ohm non-inductive resistor from grid to ground, the amplifier will be fully stable without neutralization. The 50 ohm resistor also provides an excellent termination for the exciter. Input VSWR can be improved at 30 MHz by adding a small inductor in series with the resistor. The VSWR will continue to be flat over the HF spectrum below 30 MHz, when the inductor is added.

Most of the drive power will be dissipated in the resistor. The drive power will be essentially the same for one, two or three tubes in parallel.

Improved intermodulation performance and lower zero signal power dissipation can be achieved by introducing a 27 ohm noninductive 6 Watt resistor into the cathode return of each tube. Somewhat more drive power is required (total is substantially less than 100 watts) but the reduction in zero signal resting current to 100 mA per tube and the improved 3rd order and 5th order products are worthwhile.

Mechanical Application

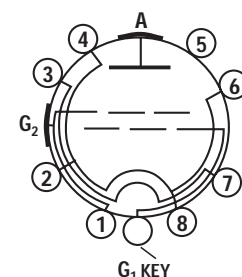
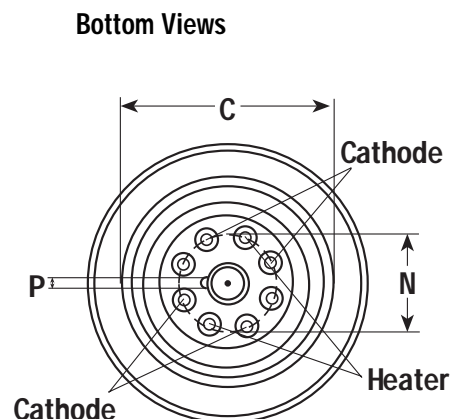
Mounting The 4CX400A may be operated in any position. A Svetlana SK2A or an Eimac/Johnson Air-System Socket, SK-600 series, or a socket designed for the 4CX250 series and having equivalent characteristics, is recommended. The Svetlana SK2A does not include a screen bypass capacitor.

Cooling The 4CX400A has a high-efficiency anode cooler. Sufficient

cooling must be provided for the anode, base seals and body seals to maintain operating temperatures below the rated maximum values. Air requirements to maintain seal temperatures at 225°C in 50°C ambient air are shown in the Minimum Cooling Air-Flow Requirements table. Sufficient flow must be provided through the socket/base area by submounting the SK2A.

Shock and Vibration The Svetlana 4CX400A is designed for the shock and vibration encountered in military applications.

Minimum Cooling Air-Flow Requirements				
Plate dissipation (Watts)	Sea Level		10,000 feet	
	Air flow (CFM)	Pressure drop (Inches of water)	Air Flow (CFM)	Pressure drop (Inches of water)
200	5.0	0.10	7.5	0.15
300	6.0	0.15	8.7	0.22
400	8.0	0.20	11.5	0.03



- 1 Screen Grid
- 2,4,6,8 Cathode
- 3,7 Heater
- 5 Internal Connection

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