

# SVETLANA TECHNICAL DATA

## 4CX800A

### High Performance Tetrode



**T**he Svetlana 4CX800A is a high-performance ceramic metal tetrode with a plate dissipation rating of 800 watts with forced air cooling. The performance characteristics of the 4CX800A allow its use as a high gain grid-driven RF amplifier or in grounded grid service. A recommended mode of operation is in grid-driven service with a passive (resistive) 50 ohm untuned input circuit. This eliminates the need for multiple input tuned circuits and neutralization. In this mode, an exceptionally simple, stable, low-cost amplifier with good intermodulation performance can be designed.

As a linear power amplifier, the 4CX800A will conservatively produce 750 watts PEP SSB, and 750 watts Key Down CW in any of the three modes: grid-driven, grid-driven passive input, and cathode-driven. Because of the high performance characteristics of the 4CX800A, the tube will operate efficiently at low plate voltage.

#### Characteristics

##### Electrical

<i>Cathode:</i>	<i>Oxide-coated</i>
Voltage	12.6 ± 0.7 V
Current, at 12.6 volts	3.6 ± 0.3 A
Voltage cathode-heater, max.	± 100 V
Warm-up time	2.5 min.
Amplification factor, grid-to-screen	6.5 ± 2
<i>Direct interelectrode capacitance (grounded cathode):</i>	
Input	51 ± 5 pF
Output	11 ± 2 pF
Feedback	0.09 pF
Frequency for maximum ratings	150 MHz

##### Mechanical

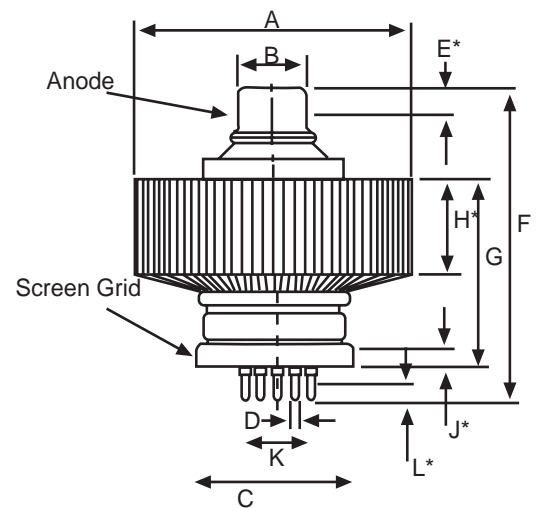
<i>Maximum overall dimensions:</i>	
Length	90 mm (3.51 in.)
Diameter	72 mm (2.81 in.)
Net weight	550 g (1.21 lb.)
Operating position	Any
Cooling	Forced air
Maximum operating envelope temperature	200°C
Recommended socket	Svetlana SK-1A
Recommended anode connector	Svetlana AC-1

##### Radio Frequency Linear Amplifier Class AB<sub>1</sub>

##### Maximum ratings

DC plate voltage	2.5 kV
DC screen voltage	350 V
DC grid voltage	-150 V
DC Plate current	0.8 A
Plate dissipation	800 W
Screen dissipation	15 W
Grid dissipation	2 W

#### Svetlana Outline drawing



\*Contact Surface

Dim.	Inches			Millimeters		
	Min.	Max.	Ref.	Min.	Max.	Ref.
A	2.756	2.835		70	72	
B	0.669	0.748		17	19	
C	1.988	2.028		50.5	51.5	
D	0.053	0.060		1.34	1.53	
E	0.394	-		10	-	
F	-	3.543		-	90	
G	2.008	2.126		51	54	
H	0.747	0.860		20	22	
J	0.197	-		5	-	
K	-	-	0.7	-	-	175
L	0.3	0.37		7.6	9.4	

Note: Ref. dimensions are for reference



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### Typical Operation (grid driven, single tone)

Frequency	60	60	MHz
Power output	550	780	W
DC plate voltage	2	2.2	kV
DC screen voltage	300	350	V
Bias voltage*	-37	-47	V
Zero-signal plate current	300	360	mA
DC plate current	465	630	mA
DC screen current	30	30	mA
Peak rf grid voltage	30	35	V
Plate dissipation	380	600	W
Intermodulation distortion measured by two tone method at 1 MHz:			
3rd order		-30	dB
5th order		-40	dB

### Typical Operation, Linear with Cathode Resistance

	Grid Driven		Cathode Driven		
DC plate voltage	2200	2200	2200	2200	V
Bias voltage	-56	-57	-57	-63	V
Zero signal plate current	160	150	100	70	mA
DC plate current	550	520	590	490	mA
Plate input power	1200	1150	1300	1100	W
Driving voltage	75	77	52	64	V
DC grid current	0	0	0	0	mA
Driving power	56 <sup>1</sup>	59 <sup>1</sup>	27 <sup>1</sup>	41 <sup>1</sup>	W
Power output	750	750	750	750	W
Intermodulation distortion					
3rd order	-30 <sup>2</sup>	-30 <sup>2</sup>	-32 <sup>2</sup>	-32 <sup>3</sup>	dB
5th order	-43 <sup>2</sup>	-42 <sup>2</sup>	-40 <sup>2</sup>	-35 <sup>3</sup>	dB
Efficiency	63	65	58	68	%
Zero-signal plate dissipation	352	330	200	154	W
DC screen voltage	350	350	300	300	V
DC screen current	24	24	20	17	mA
Cathode resistance	24 <sup>4</sup>	33 <sup>4</sup>	0	24 <sup>4</sup>	ohms

### Typical Operation, FM Broadcast Power Amplifier

	CCS
DC Plate Voltage	2200 V
Bias Voltage	-70 V
Driving Voltage	80 V
DC Plate Current	500 mA
DC Screen Current	30 mA
DC Grid Current	12 mA
Power Output	800 W
Screen Dissipation	8 W
Grid Dissipation	1 W
Efficiency	73 %

\* Approximate value adjusted to specified zero-signal plate current

Notes:

1. The drive power is determined with a 50 ohm resistive input circuit.
2. The intermodulation distortion level does not deteriorate with decreasing drive voltage.
3. The level of intermodulation distortion with decreasing drive voltage does not deteriorate to less than -28 dB and -35 dB respectively corresponding to a driving voltage of 50 V.
4. Increasing the resistance in the cathode circuit decreases the zero-signal plate current and increases the drive power required.

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**Linear Operation** Operating conditions with feedback are shown in the table on the previous page under Typical Operation, Linear with Cathode Resistance. This mode of operation is recommended for linear amplifier service where low zero signal plate current together with good intermodulation performance is required. These conditions were optimized for 750 watts power output, low zero signal plate current and intermodulation performance. A resistor is introduced in the cathode circuit to provide degeneration for improved linearity and reduced zero signal plate current. Increasing the resistance in the cathode circuit decreases the zero signal plate current and increases the required drive power. The drive power shown in the table was determined using a 50 ohm resistor for the input circuit. Note that no input tuned circuit or neutralization is required.

**Plate Operation** The rated maximum plate dissipation power of the 4CX800A is 800 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 the arc, and should not be used as a fuse.

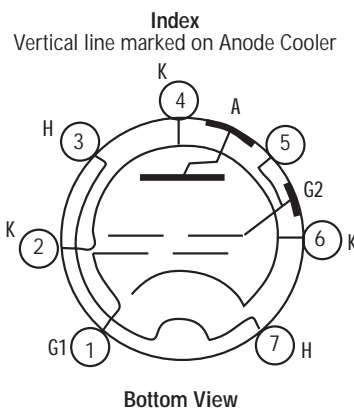
**Control Grid Operation** The maximum grid dissipation rating of the 4CX800A is 2 watts. The grid should not be driven unless screen and plate voltage is applied. The grid and associated circuitry should be protected against current surges in the event of internal arcs by a source impedance of greater than 50 ohms. For stability, the source impedance should not exceed 1K ohms.

**Screen Grid Operation** The maximum rated power dissipation for the screen grid is 15 watts. The screen current may reverse under certain conditions and produce negative current. This is a normal characteristic of most tetrodes. The screen power supply should be designed with this characteristic in mind. A current path from screen to cathode must be provided and the source impedance should

not exceed 3K ohms. When plate voltage, plate load or bias voltage is removed, screen grid voltage should be turned off automatically. Otherwise, screen grid power dissipation will be exceeded.

**Cathode Operation** The cathode is internally connected to pins 2, 4 and 6. Three of the corresponding socket terminals should be used to make connection to the external circuits. At radio frequencies, it is important 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.

**Mounting** The Svetlana SK-1A socket is available for use with the 4CX800A. The SK-1A has a built-in annular screen bypass capacitor of 0.01  $\mu$ F suitable for use at HF and VHF. The tube may be mounted in any orientation.



Svetlana 4CX800A Air-Flow Requirements				
Plate power dissipation (Watts)	Sea level		5,000 feet	
	Air flow CFM	Pressure drop in./water	Air flow CFM	Pressure drop in./water
Cooling air at 25°C	400	6	7	0.2
	600	12	14	0.3
	800	20	25	0.6
Cooling air at 50°C	400	8	10	0.2
	600	17	21	0.4
	800	29	35	0.6

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