

# SVETLANA TECHNICAL DATA

## 4CX1600B

### High Performance Tetrode



**T**he Svetlana™ 4CX1600B is a high-performance ceramic/metal tetrode with a plate dissipation rating of 1600 Watts with forced air cooling. The performance characteristics and internal configuration of the 4CX1600B allow its use as a high gain grid-driven RF amplifier or a grounded grid amplifier. 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, a simple, stable, low-cost amplifier design with good intermodulation performance can be achieved.

As a linear power amplifier, the 4CX1600B will conservatively produce 1500 Watts PEP SSB, and 1500 Watts Key Down CW in any of the three modes: grid-driven, grid-driven passive input, and cathode-driven. Because of the unique internal geometry of the Svetlana 4CX1600B, the tube will operate efficiently at low plate voltage. Improved electron ballistics using a double-focused electron trap configuration contribute to the superior performance.

#### Characteristics

##### Electrical

<i>Cathode:</i>	<i>Oxide-coated</i>	
Voltage	12.6 ± 0.6	V
Current, at 12.6 volts	4.4 ± 0.3	A
Voltage, cathode-heater, max.	± 100	V
Warm-up time	2.5	min.
Transconductance	50	mA/V
<i>Direct interelectrode capacitances (grounded cathode):</i>		
C in	86	pF
C out	12	pF
C gp	0.15	pF
Maximum frequency for full ratings	250	MHz

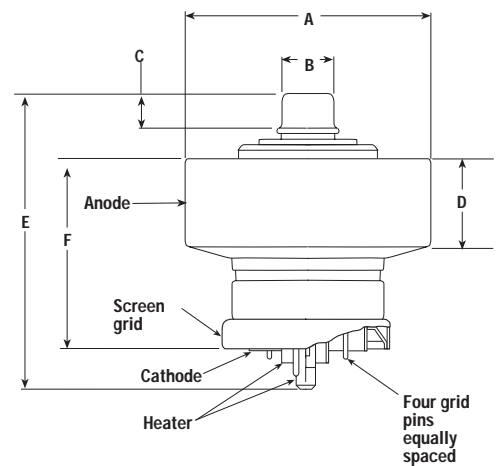
##### Mechanical

<i>Maximum overall dimensions:</i>		
Length	109 mm	(4.29 in.)
Diameter	86 mm	(3.39 in.)
Net weight	750 g	(1.65 lb.)
Operating position	Any	
Cooling	Forced air	
Maximum operating envelope temperature	250° C	
Recommended Socket	Svetlana SK3A	
Recommended Anode Connector	Svetlana AC-2	
Recommended Air System Chimney	Svetlana CH1600B	

##### Radio Frequency Linear Amplifier, Maximum ratings

DC plate voltage	3.3	kV
DC screen voltage	350	V
DC grid voltage	-150	V
DC Plate current	1.4	A
Plate dissipation	1.6	kW
Screen dissipation	20	W
Grid current	5	mA

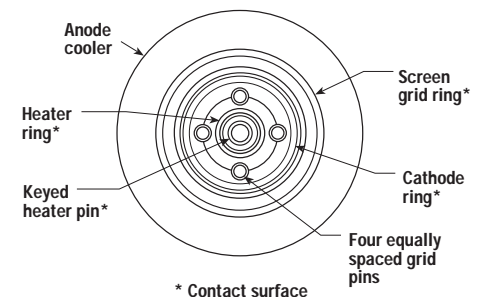
#### Svetlana Outline drawing



#### Tube Dimensional Data

Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	3.34	3.39	84.8	86
B	0.67	0.75	17	19
C	0.394	—	10	—
D	1.14	1.22	29	31
E	—	4.29	—	109
F	2.60	2.70	66.1	68.6

#### Bottom View



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## Typical Operation, Grid Driven, Single Tone

Frequency	75	75	75	MHz
Power output	1600	1500	1650	W
DC plate voltage	2400	2400	3200	V
DC screen voltage	350	350	240	V
Bias voltage <sup>1</sup>	-53	-70	-57	V
Zero-signal plate current	500	200	200	mA
DC plate current	1100	870	740	mA
DC screen current	20	48	21	mA
DC grid current	0	0	0	mA
Driving voltage	50	88	55	V
Driving power <sup>2</sup>	25	77	30	W
CW plate input power	2640	2088	2368	W
Intermodulation distortion: <sup>3</sup> 3rd order	-36	-30	-31	dB
5th order	-58	-34	-41	dB
Efficiency	61	72	70	%
Cathode resistance	0	24	0	Ohms

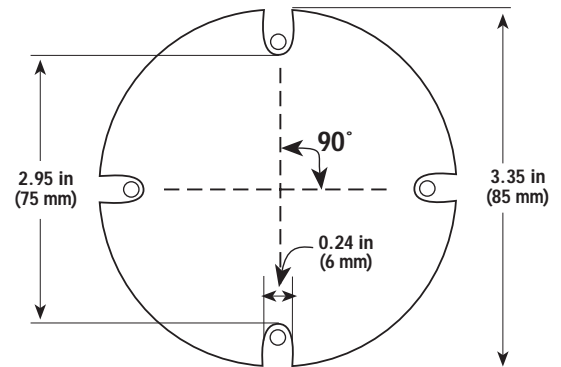
### Notes:

1. Approximate value, adjust to specified zero-signal plate current.
2. The driving power is determined by the 50-Ohm resistive input circuit.
3. Intermodulation distortion measured by two-tone method referenced to one of two equal tones.

## Typical Operation, FM Broadcast Amplifier, Grid Driven

Power output	1650	1650	W
DC plate voltage	2500	3200	V
DC screen voltage	350	260	V
Bias voltage	-90	-98	V
DC plate current	950	650	mA
DC screen current	54	18	mA
DC grid current	0	0	mA
Plate input power (CW)	2375	2080	W
Efficiency	69	79	%

## Chassis Cutout Drawing: Svetlana SK3A



Note: Four socket mounting tabs at 90°. Drill four holes to clear 10/32 mounting bolts on an 85 mm diameter bolt circle.

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### Electrical Application

**Grid-Driven Operation** The internal geometry of the 4CX1600B has a crossover feature which facilitates convenient circuit design for high-performance grid-driven RF power amplifiers. The screen grid and cathode external terminations are large coaxial connections closely adjacent so they can be effectively by-passed together. The grid termination consists of four pins which extend through the cathode connecting cone, eliminating common lead inductance. This configuration provides excellent input/output isolation.

**Linear operation** The operating data under typical operation, grid-driven, reflects the use of a resistance in the cathode lead of 24 Ohms. This resistance provides degeneration which reduces gain, reduces resting current, and improves linearity when an amplifier is operating at high efficiency.

**Plate operation** The inside surface of the 4CX1600B plate has a series of deep recesses into which electron beamlets, formed by double grid focusing, are directed. This combination of double focusing and anode electron traps promotes high conversion efficiency and enhanced linearity at low plate voltage. The rated maximum plate dissipation of the 4CX1600B is 1600 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 current rating of the 4CX1600B is 5 milliamperes. 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 1000 Ohms.

**Screen grid operation** The maximum rated power dissipation for the screen grid is 20 Watts. The screen terminates externally in a large coaxial ring to facilitate low inductance r.f. connection with ground and cathode (see cathode operation).

The screen current may reverse under certain conditions and produce negative screen current. 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 on the screen under all conditions. A current path from screen to cathode must be provided and the source impedance should not exceed 10,000 Ohms. When plate voltage, plate load or bias voltage is removed, screen grid voltage should be turned off automatically. Otherwise, the screen-grid power dissipation rating will be exceeded.

**Cathode operation** The Svetlana 4CX1600B cathode surface has alternate vertical emissive areas and non-emissive areas. This striped cathode configuration together with aligned grids maintains the grid current at the lowest possible level for enhanced linearity.

**Mounting** The SK3A socket is available from Svetlana for use with the 4CX1600B. The tube may be mounted in any position. The SK3A has a built-in annular 0.01  $\mu$ F screen bypass capacitor suitable for use at HF and VHF. The capacitor is removable for certain applications. Contact Svetlana for this technical information.

4CX1600B Air-Flow Requirements				
Plate dissipation(watts)	Cooling air at 25°C		Cooling air at 50°C	
	Air Flow CFM	Pressure drop inches of water	Air Flow CFM	Pressure drop inches of water
Sea level				
1000	22	0.20	27	0.33
1600	36	0.40	47	0.76
6,000 feet				
1000	27	0.25	33	0.40
1600	44	0.50	58	0.95

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