

PL8169 / 4CX3000A Radial - Beam Power Tetrode



The Penta Laboratories PL8169/4CX3000A is a ceramic / metal power tetrode designed to be used as a Class AB₁ linear amplifier in audio or radio-frequency applications. Its low intermodulation distortion characteristics make it especially suitable for single-sideband service, where it will produce a minimum power output of 5000 watts in Class AB₁ service with intermodulation distortion at least 32 dB down for 3rd order products and 37 dB down for 5th order products.

The tube is also recommended for use as a Class C rf power amplifier and plate-modulated rf power amplifier. It is forced-air cooled, with a maximum anode dissipation rating of 3500 watts.

ELECTRICAL

Filament: Thoriated Tungsten

Voltage	9.0 ±0.45	V
Current (at 9.0 volts).....	41.5	A
Amplification Factor (grid to screen)	5.5	
Frequency for Maximum Ratings (CW)	150	MHz
Direct Interelectrode Capacitance (grounded cathode) ²		
Cin	130	pF
Cout	12.5	pF
Cgp	1.2	pF
Direct Interelectrode Capacitance (grounded grid) ²		
Cin	61	pF
Cout	12.5	pF
Cpk	0.15	pF

1. Characteristics and operating values are based upon performance tests, These figures may change without notice as the result of additional data or product refinement. Penta Laboratories should be consulted before using this information for final equipment design.
2. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electron Industries Association Standard RS-191.

MECHANICAL

Base Special ring and breechblock terminal surfaces

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P E N T A L A B O R A T O R I E S

9740 COZYCROFT AVENUE * CHATSWORTH * CALIFORNIA 91311
(800) 421-4219 * (818) 882-3872 * FAX: (818) 882-3968

ELECTRON TUBES FOR INDUSTRY



Maximum Operating Temperature:
 Ceramic/Metal Seals and Anode Core 250°C
 Recommended Air System Socket Penta PSK-1406 series
 Recommended Air Chimney Penta PSK-1406
 Operating Position Axis vertical, base up or down
 Maximum Overall Dimensions:
 Length 7.90 In; 20.07 cm
 Diameter 4.62 In; 11.73 cm
 Cooling Forced Air
 Net Weight 5.5 lb; 2.5 kg

RADIO - FREQUENCY POWER AMPLIFIER OR OSCILLATOR
Class-C Telegraphy or FM (Key-down conditions)

ABSOLUTE MAXIMUM RATINGS:

DC Plate Voltage	7000	Volts
DC Screen Voltage	1000	Volts
DC Plate Current	2.0	Amperes
Plate Dissipation	3000	Watts
Screen Dissipation	175	Watts
Grid Dissipation	50	Watts

TYPICAL OPERATION

Plate Voltage	5000	7000	Vdc
Screen Voltage	500	500	Vdc
Grid Voltage	-280	-300	Vdc
Plate Current	1.9	1.9	Adc
Screen Current ¹	250	230	mAdc
Grid Current ¹	100	100	mAdc
Peak RF Grid Voltage ¹	385	405	v
Driving Power ¹	39	41	W
Plate Dissipation	1900	2300	W
Plate Output Power	7600	11,000	W

1. Approximate value.

PLATE - MODULATED RADIO - FREQUENCY POWER AMPLIFIER
Class-C Telephony (Carrier Conditions unless noted)

ABSOLUTE MAXIMUM RATINGS:

DC Plate Voltage	5000	Volts
DC Screen Voltage	600	Volts
DC Plate Current	1.4	Amperes
Plate Dissipation ²	2000	Watts
Screen Dissipation	175	Watts
Grid Dissipation	50	Watts



TYPICAL OPERATION

Plate Voltage	5000	Vdc
Screen Voltage	500	Vdc
Peak AF Screen Voltage (For 100% Modulation) ¹	415	V
Grid Voltage	-375	Vdc
Plate Current	1.4	Adc
Screen Current ¹	170	mAdc
Grid Current ¹	68	mAdc
Peak RF Grid Voltage ¹	455	v
Grid Driving Power ¹	31	W
Plate Dissipation	1250	W
Plate Output Power	5750	W

1. Approximate value.
2. Corresponds to 3000 watts at 100% sine-wave mod.

**AUDIO - FREQUENCY AMPLIFIER OR MODULATOR
Class-AB**

ABSOLUTE MAXIMUM RATINGS:

DC Plate Voltage	6000	Volts
DC Screen Voltage	1000	Volts
DC Plate Current	2.0	Amperes
Plate Dissipation	3500	Watts
Screen Dissipation	175	Watts
Grid Dissipation	50	Watts

TYPICAL OPERATION

Plate Voltage	5000	6000	Vdc
Screen Voltage	850	850	Vdc
Grid Voltage	-180	-200	Vdc
Max-Signal Plate Current	3.6	3.1	Adc
Zero-Signal Plate Current	1.0	0.7	Adc
Max-Signal Screen Current ²	170	120	mAdc
Zero-Signal Screen Current ²	0	0	mAdc
Peak AF Grid Voltage ^{1,2}	155	175	v
Driving Power	0	0	W
Load Resistance, Plate-to-Plate	3000	4160	Ω
Max-Signal Plate Dissipation ¹	3300	3100	W
Max-Signal Plate Output Power	11,400	12,400	W

1. Per Tube.
2. Approximate values.



**RADIO - FREQUENCY LINEAR AMPLIFIER
Class AB**

ABSOLUTE MAXIMUM RATINGS:

DC Plate Voltage	7000	Volts
DC Screen Voltage	1000	Volts
DC Plate Current	2.0	Amperes
Plate Dissipation	3500	Watts
Screen Dissipation	175	Watts
Grid Dissipation	50	Watts

TYPICAL OPERATION

Plate Voltage	5000	Vdc
Screen Voltage	850	Vdc
Grid Voltage	-180	Vdc
Zero-Signal Plate Current	0.5	Adc
Single-Tone Plate Current	1.65	Adc
Single-Tone Screen Current ¹	25	mAdc
Two-Tone Plate Current ¹	1.10	Adc
Two-Tone Screen Current ¹	20	mAdc
Peak RF Grid Voltage ¹	155	v
Driving Power ¹	0	W
Peak Envelope Useful Output Power ¹	5300	W
Intermodulation Distortion Products		
(without negative feedback) 3rd Order	-35	dB
5th Order	-40	dB

1. Approximate values.

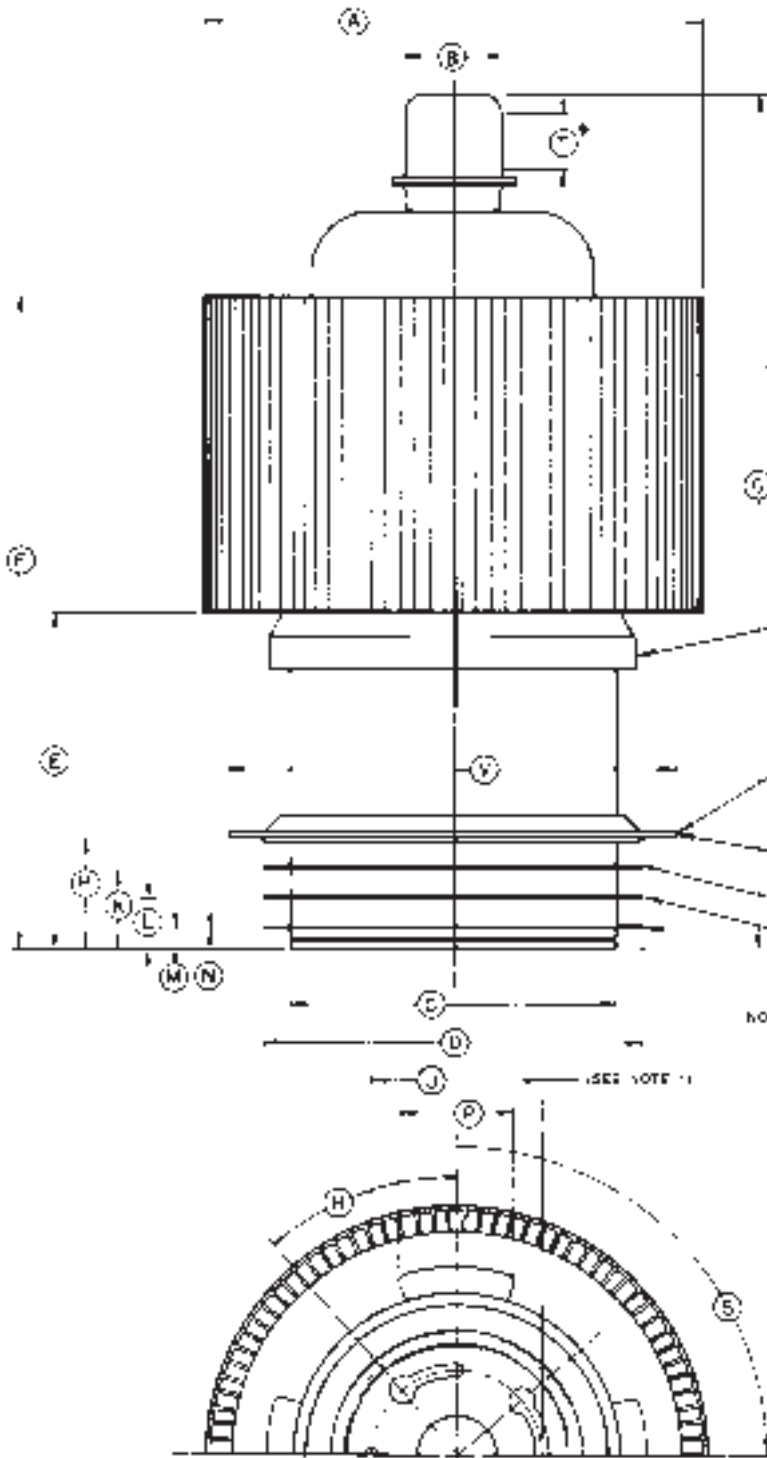
NOTE: TYPICAL OPERATION data are obtained from direct measurement or by calculation from published characteristic curves. Adjustment of the rf grid voltage to obtain the specified plate current at the specified bias, screen and plate voltages is assumed. If this procedure is followed, there will be little variation in output power when the tube is changed, even though there may be some variation in grid and screen current. The grid and screen currents which result when the desired plate current is obtained are incidental and vary from tube to tube. These current variations cause no difficulty so long as the circuit maintains the correct voltage in the presence of the variations in current. In the case of Class C Service, if grid bias is obtained principally by means of a grid resistor, the resistor must be adjustable to obtain the required bias voltage when the correct rf grid voltage is applied.



RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.	
Filament Current, at 9.0 volts	39.5	43.5	A
Interelectrode Capacitance (grounded cathode) ¹			
Cin	120	140	pF
Cout	10.5	14.5	pF
Cgp	---	1.40	pF
Interelectrode Capacitance (grounded grid) ¹			
Cin	55.0	67.0	pF
Cout	10.5	14.5	pF
Cgk	---	0.20	pF
Grid Voltage (Eb = 2000 Vdc; Ec2 = 750 Vdc;	-95	-127	Vdc
adjust for Ib = 1000 mAdc)			
Grid Cut off Voltage (Eb = 4000 Vdc; Ec2 = 850 Vdc;	---	-310	Vdc
adjust for (Ib = 1.0 mAdc)			

1. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electronic Industries Association Standard RS-191

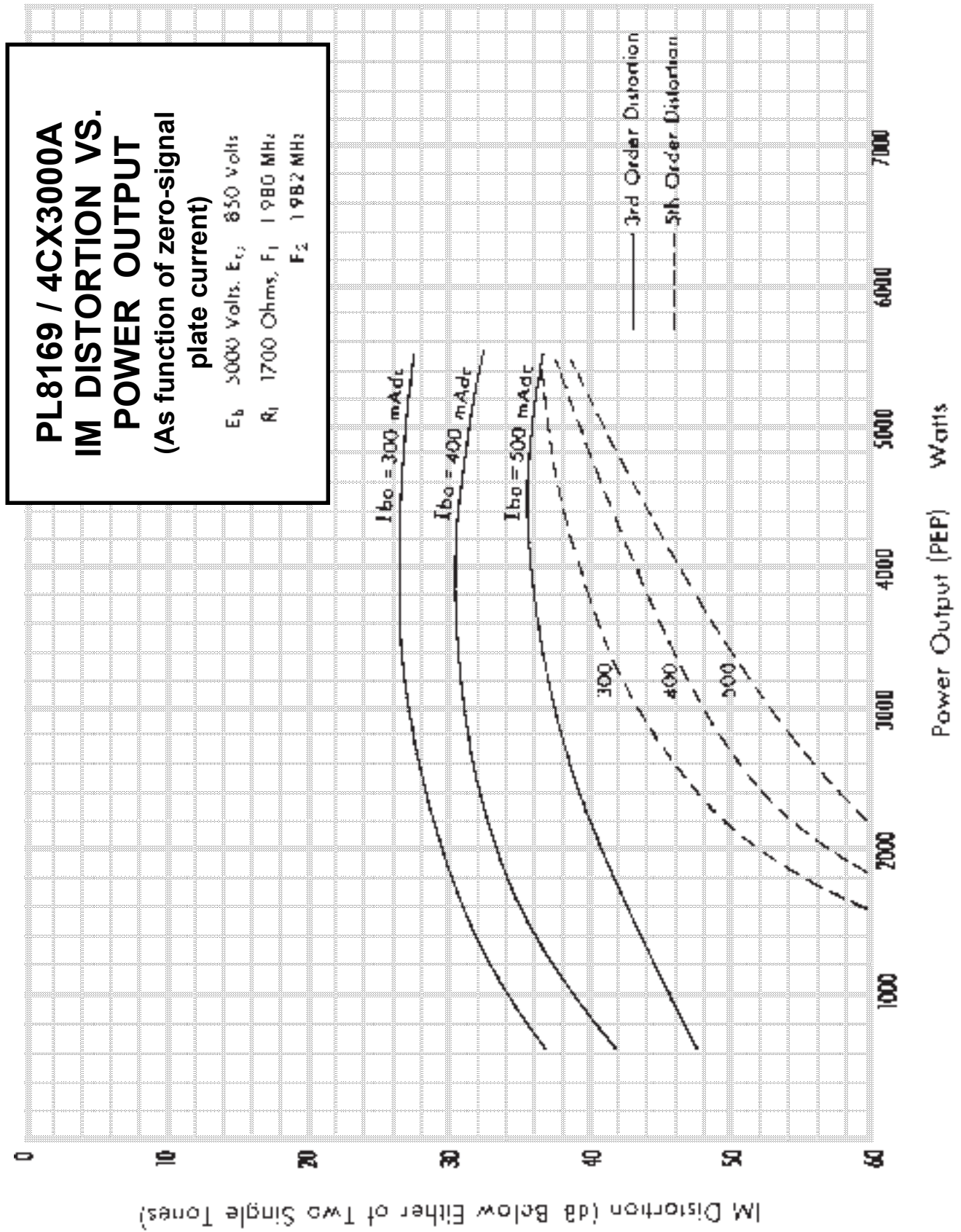


DIM	INCHES			MILLIMETERS		
	MIN	MAX	REF	MIN	MAX	REF
A	4.560	4.675	-	116.2	118.8	-
B	0.860	0.890	-	21.84	22.61	-
C	-	3.050	-	-	77.44	-
D	3.490	3.560	-	88.65	90.17	-
E	2.875	3.125	-	73.03	79.38	-
F	5.875	6.125	-	148.25	155.58	-
G	7.620	7.900	-	193.04	200.66	-
H	0.955	0.95	-	24.51	24.13	-
N	0.800	0.790	-	20.32	20.04	-
L	0.430	0.460	-	10.92	11.68	-
M	0.160	0.180	-	4.06	4.57	-
W	0.08	0.025	-	0.48	0.64	-
P	1.050	1.150	-	26.67	29.27	-
R	33°	41°	-	39°	41°	-
S	85°	91°	-	89°	91°	-
T	0.485	-	-	12.32	-	-
U	1.557	1.567	-	39.43	39.80	-
V	4.000	4.175	-	101.60	106.06	-

ANODE

NOTES

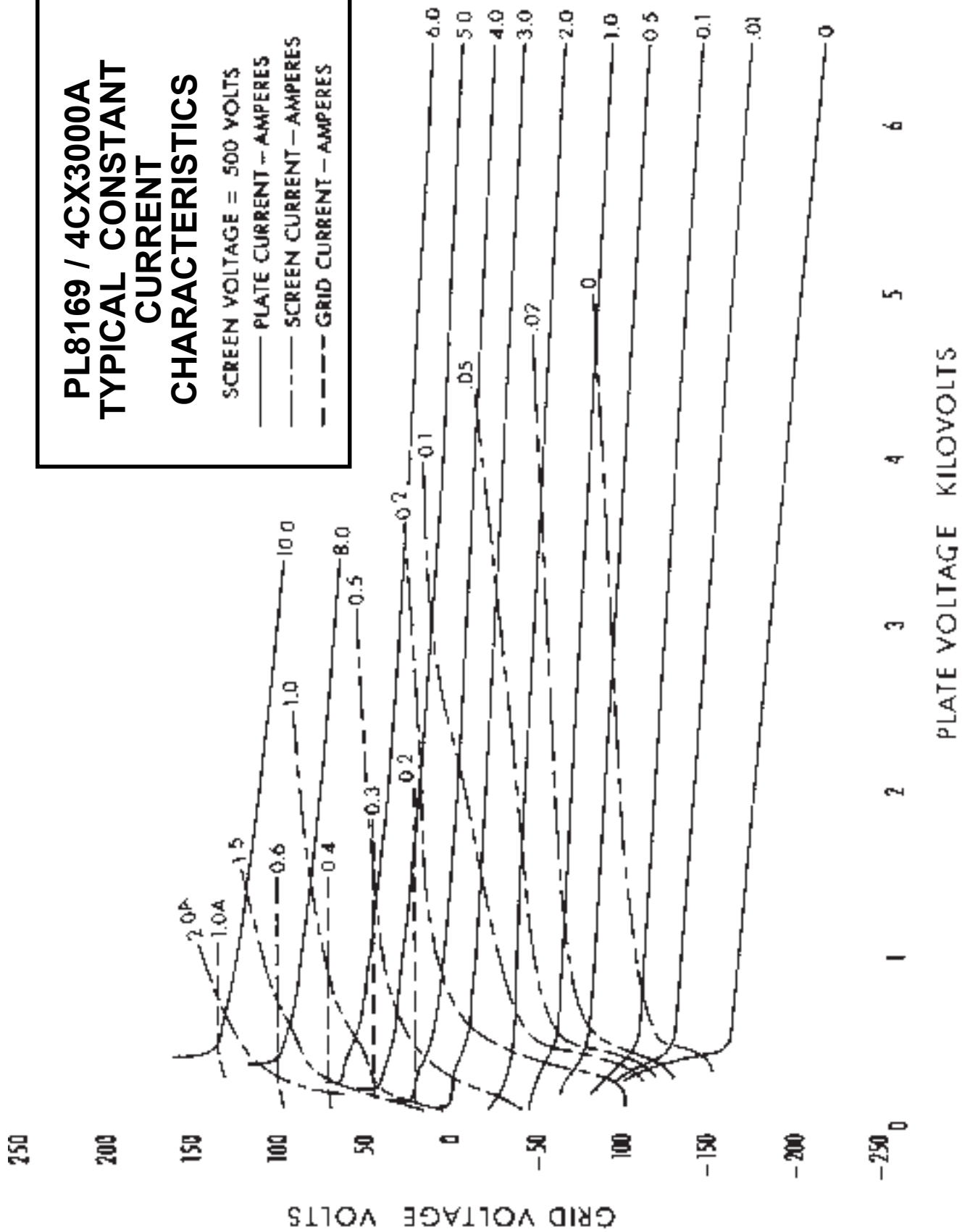
- 1. LEAD BEAD MUST BEAPPLIED TO LEAD WITH COPPER OR TIN PLATING AT MINIMUM. THIS IS POLYMER IN A PASTE BEAD. LEAD THICK BY 1.5X 0.2.





**PL8169 / 4CX3000A
TYPICAL CONSTANT
CURRENT**

CHARACTERISTICS
SCREEN VOLTAGE = 500 VOLTS
— PLATE CURRENT — AMPERES
- - - SCREEN CURRENT — AMPERES
- - - - GRID CURRENT — AMPERES





**PL8169 / 4CX3000A
TYPICAL CONSTANT
CURRENT**

CHARACTERISTICS

SCREEN VOLTAGE = 850 VOLTS

- PLATE CURRENT — AMPERES
- - - SCREEN CURRENT — AMPERES
- - - GRID CURRENT — AMPERES

