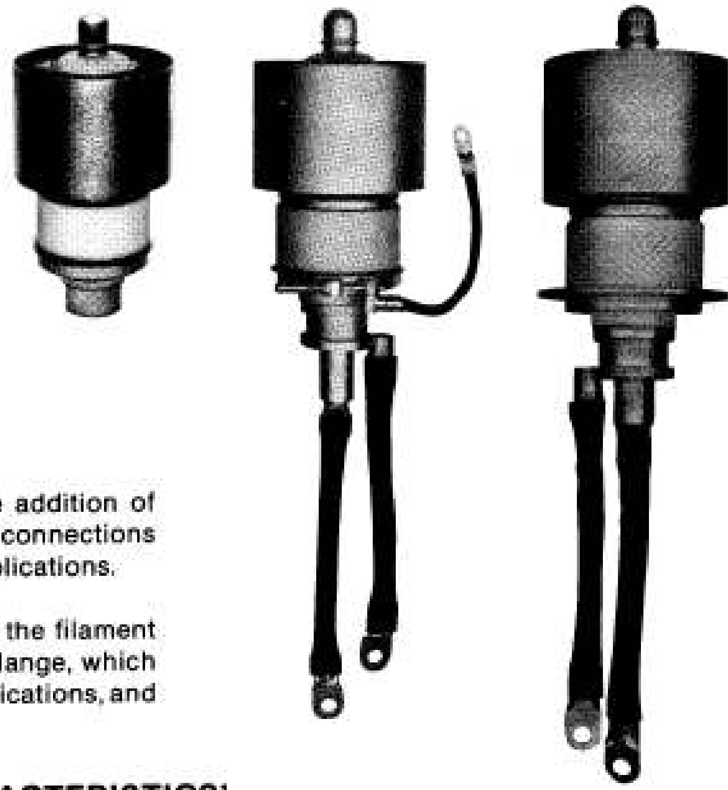
TECHNICAL DATA

The EIMAC 3CX2500A3, 3CX2500F3, and 3CX2500H3 are medium-mu, all ceramic-and-metal, forced-air cooled, external anode power triodes with a maximum plate dissipation rating of 4000 watts. High power output as an amplifier, oscillator, or modulator may be obtained at moderate voltages.

The 3CX2500A3 has a rugged, low-inductance cylindrical filament-stem structure, which readily becomes a part of a linear filament tank circuit for VHF operation. The grid provides good shielding between the input and output circuits for grounded-grid applications and is conveniently terminated in a ring between the plate and filament terminals.

3CX2500A3 3CX2500F3 3CX2500H3



The 3CX2500F3 tube is identical except for the addition of flexible leads on the base for grid and filament connections which can simplify socketing in low frequency applications.

The 3CX2500H3 tube also has flexible leads for the filament connections, but the grid terminates on a rugged flange, which may be used for mounting the tube in industrial applications, and the ceramic is glazed for ease of cleaning.

GENERAL CHARACTERISTICS[1]

ELECTRICAL

Filament: Thoriated-tungsten

Voltage	7.5 0.37 V
Current @ 7.5 V	51.5 A
Amplification Factor (average)	22
Direct Interelectrode Capacitance (grounded filament)[2]	
Cin	35 pF
Cout	0.9 pF
Cgp	20 pF
Frequency of Maximum Rating: (3CX2500A3)	110 MHz
Frequency of Maximum Rating: (3CX2500F3/H3)	75 MHz

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. EIMAC Division of Varian 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.

4088 (Effective 3-1-79)

Printed in U.S.A.

Varian, EIMAC division/301 industrial way/san carlos/california 94070

MECHANICAL

Maximum Overall Dimensions:

Length (3CX2500A3) .... 9.000 In; 22.76 cm

(3CX2500F3/H3, incl. fil. leads .... 18.437 In; 46.83 cm

Diameter (3CX2500A3/F3) .... 4.156 In; 10.56 cm

(3CX2500H3) .... 4.250 In; 10.79 cm

Operating Position (all 3 types) .... Vertical, base up or down

Net Weight (Approx): (3CX2500A3) .... 6.2 lb; 2.8 kg

(3CX2500F3) .... 7.0 lb; 3.2 kg

(3CX2500H3) .... 6.5 lb; 2.9 kg

Cooling .... Forced Air

Base (3CX2500A3) .... Special Coaxial

(3CX2500A3/H3) .... Special with Flying Leads

Maximum Operating Temperature:

Anode Core & Ceramic/Metal Seals .... 250°C

3CX2500F3/H3 Filament Lead/Tube Base Junctions .... 150°C

RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Conventional Neutralized Amplifier, Class-C FM or Telegraphy (Key-down Condtions)

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	6000 VOLTS
DC PLATE CURRENT	-	2.5 AMPERES
PLATE DISSIPATION	-	4000 WATTS
GRID DISSIPATION	-	150 WATTS
DC GRID VOLTAGE	-	-1000 VOLTS
DC GRID CURRENT	-	0.4 AMPERE

TYPICAL OPERATION (Frequencies below 30 MHz)

Plate Voltage	4000	5000	6000	Vdc
Plate Current	2.5	2.5	2.08	Adc
Grid Voltage	—300	—450	—500	Vdc
Grid Current	245	265	180	mAdc
Peak RF Grid Input Voltage*	580	750	765	v
Driving Power*	142	197	136	W
Grid Dissipation*	68	78	46	W
Plate Input Power	10,000	12,500	12,500	W
Plate Dissipation	2500	2500	2500	W
Plate Output Power	7500	10,000	10,000	W

*Approximate values.

PLATE-MODULATED RADIO-FREQUENCY AMPLIFIER

Conventional Neutralized Amplifier, Class-C Telephony (Carrier Conditions)

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	5500 VOLTS
DC PLATE CURRENT	-	2.0 AMPERES
PLATE DISSIPATION	-	2670 WATTS
GRID DISSIPATION	-	150 WATTS
DC GRID VOLTAGE	-	-1000 VOLTS

TYPICAL OPERATION (Frequencies below 30 MHz)

Plate Voltage	4000	4500	5000	Vdc
Plate Current	1.67	1.47	1.25	Adc
Grid Voltage	—450	—500	—550	Vdc
Grid Current*	180	140	150	mAdc
Peak RF Grid Input Voltage*	685	715	760	v
Driving Power*	125	100	115	W
Grid Dissipation*	43	30	32	W
Plate Input Power	6670	6615	6250	W
Plate Dissipation	1670	1315	950	W
Plate Output Power	5000	5300	5300	W

*Approximate values.

AUDIO-FREQUENCY POWER AMPLIFIER OR MODULATOR

Class-AB or B

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	6000 VOLTS
DC PLATE CURRENT	-	2.5 AMPERES
PLATE DISSIPATION	-	4000 WATTS
GRID DISSIPATION	-	150 WATTS
DC GRID VOLTAGE	-	-1000 VOLTS

TYPICAL OPERATION (Sinusoidal wave, two tubes unless noted)

Plate Voltage	4000	5000	6000	Vdc
Grid Voltage¹	—150	—190	—240	Vdc
Zero-Signal DC Plate Current	0.6	0.5	0.4	Adc
Max-Signal DC Plate Current	4.0	3.2	3.0	Adc
Effective Load, Plate to Plate	2200	3600	4650	ohms
Peak AF Grid Input Voltage (per tube)*	340	360	390	v
Max-Signal Peak Driving Power*	340	230	225	w
Max-Signal Nominal Driving Power*	170	115	113	W
Max-Signal Plate Output Power	11,000	11,000	13,000	W

*Approximate values.

¹Adjust to give listed zero-signal plate current.

NOTE: TYPICAL OPERATION data are obtained by measurement or calculation from published characteristic curves. Adjustment of the rf grid voltage to obtain the specified plate current at the specified bias, 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 current. The grid current which results when the desired plate current is obtained is incidental and varies 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. 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.	MIN.	
Filament: Current at 7.5 volts	48	54	A
Interelectrode Capacitance[1] (grounded filament connection)			
Input	29.2	40.2	pF
Output	0.6	1.2	pF
Feedback	16.8	23.2	pF
Grid Bias voltage, for anode voltage = 3000 Vdc and anode current = 0.83 Adc	-67	-100	Vdc

1. Capacitance values are for a cold tube as measured in a shielded fixture.

APPLICATION

MECHANICAL

MOUNTING - Any of the three tubes must be mounted vertically, base up or down at the convenience of the circuit designer. The 3CX2500H3 is normally mounted by its grid flange.

Filament connection to the base of the 3CX2500A3 is normally made by spring collets. These are available from EIMAC with the following part numbers:

149575 Inner Line Collet
149576 Outer Line Collet

Reasonable care should be taken that these collets do not impart undue strain to the terminals or the base of the tube.

COOLING - The maximum temperature rating for the anode core and the ceramic/metal seal areas of these tubes is 250°C, and sufficient forced-air cooling must be provided to assure operation at safe tube temperatures. Tube life is usually prolonged if cooling in excess of absolute minimum requirements is provided for cooler tube temperatures.

The filament leads of the F3 and H3 versions are attached to the tube with soft solder, and care must therefore be taken to supply sufficient cooling to this area of the tube to maintain temperatures below 150°C to avoid melting or loosening of these leads.

Minimum air flow requirements to maintain anode core and ceramic/metal seal areas below 225°C at sea level with an inlet-air temperature of 40°C are tabulated for air-flow in the base-to-anode and anode-to-base directions. At higher ambient temperatures, frequencies above 30 MHz, or at higher altitudes, a greater quantity of air will be required.

Base-to-Anode Air Flow				
	Sea Level		5,000 Feet	
Anode Dissipation watts	Air Flow CFM	Pressure Drop Inches water	Air Flow CFM	Pressure Drop Inches water
2500	36	0.60	43	0.72
4000	67	1.20	80	1.45
Anode-to-Base Air Flow				
2500	42	0.70	50	0.84
4000	84	1.70	101	2.00

With air flowing in a base-to-anode direction, and with the specified air also flowing past the base section of the tube, no additional base cooling of these types is normally required. With air flowing in an anode-to-base direction, they will require additional cooling air directed into the filament stem structure, between the inner and outer filament terminals, in the amount of 5 cfm minimum, directed by an appropriate air nozzle or pipe.

It is suggested that temperatures, especially in the base area of the tube, be monitored in any new installation to insure proper cooling. Temperatures may be measured with any of the available temperature-sensing paint or crayon materials.

ELECTRICAL

FILAMENT OPERATION - The filament voltage, as measured at the filament terminals, should be 7.5 volts, with maximum allowable variations due to line fluctuations of from 7.12 to 7.87 volts.

INTERLOCKS - An interlock device should be provided to insure that cooling air flow is established before application of electrical power, including the filament. The circuit should be so arranged that rf drive cannot be applied in the absence of normal plate voltage.

RADIO FREQUENCY RADIATION - Avoid exposure to strong rf fields even at relatively low frequency. Absorption of rf energy by human tissue is dependent on frequency. Under 30 MHz, most of the energy will pass completely through the human body with little attenuation or heating effect. Public health agencies are concerned with the hazard, however, even at these frequencies, and it is worth noting that some commercial dielectric heating units actually operate at frequencies as low as the 13 and 27 MHz bands.

Many EIMAC power tubes, such as these, are specifically designed to generate or amplify radio frequency power. There may be a relatively strong rf field in the general proximity of the power tube and its associated circuitry--the more power involved, the stronger the rf field. Proper enclosure design and efficient coupling of rf energy to the load will minimize the rf field in the vicinity of the power amplifier unit itself.

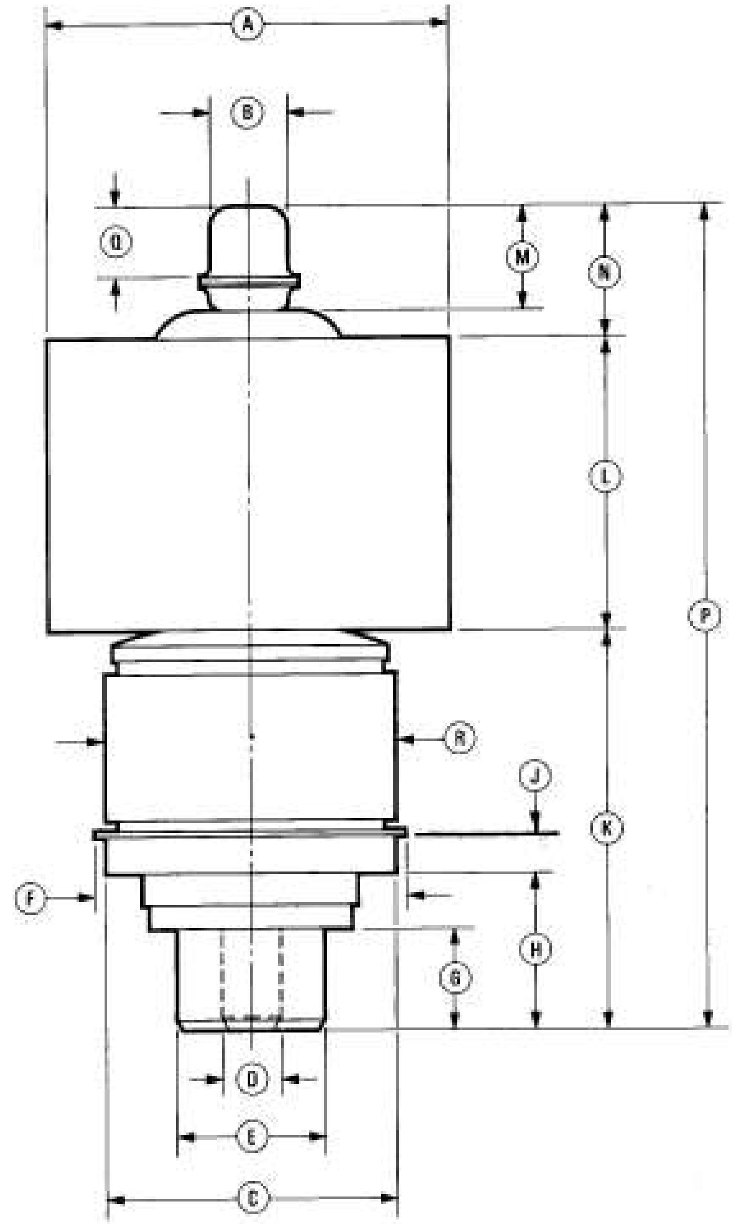
FAULT PROTECTION - In addition to normal cooling airflow interlock and plate overcurrent interlock it is good practice to protect the tube from internal damage which could result from occasional plate arcing at high plate voltage. In all cases some protective resistance should be used in series with the tube anode to absorb power supply stored energy in case a plate arc should occur. EIMAC Application Bulletin #17 titled "FAULT PROTECTION" is available on request and contains considerable detail on the subject.

HIGH VOLTAGE - Normal operating voltages used with these tubes are deadly, and the equipment must be designed properly and operating precautions must be followed. Design all equipment so that no one can come in contact with high voltages. All equipment must include safety enclosures for high-voltage circuits and terminals, with interlock switches to open primary circuits of the power supply and to discharge high-voltage condensers whenever access doors are opened. Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that HIGH VOLTAGE CAN KILL.

INTERELECTRODE CAPACITANCE - The actual internal interelectrode capacitance of a tube is influenced by many variables in most applications, such as stray capacitance to the chassis, capacitance added by the socket used, stray capacitance between tube terminals, and wiring effects. To control the actual capacitance values within the tube, as the key component involved, the industry and Military Services use a standard test procedure as described in Electronic Industries Association Standard RS-191. This requires the use of specially constructed test fixtures which effectively shield all external tube leads from each other and eliminates any capacitance reading to "ground". The test is performed on a cold tube. Other factors being equal, controlling internal tube capacitance in this way normally assures good interchangeability of tubes over a period of time, even when the tube may be made by different manufacturers. The capacitance values shown in the manufacturer's technical data, or test specifications, normally are taken in accordance with Standard RS-191.

The equipment designer is therefore cautioned to make allowance for the actual capacitance values which will exist in any normal application. Measurements should be taken with the socket and mounting which represent approximate final layout if capacitance values are highly significant in the design.

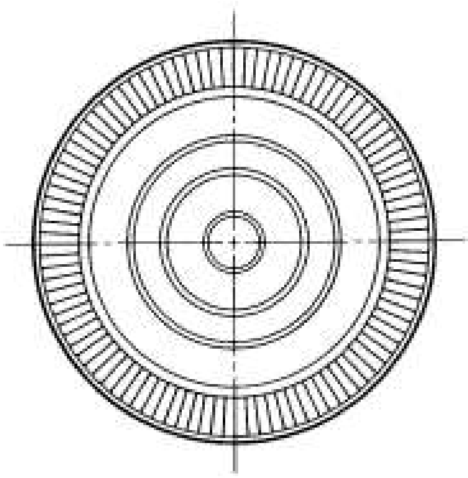
SPECIAL APPLICATION - If it is desired to operate this tube under conditions widely different from those listed here, write to Power Grid Tube Division, EIMAC Division of Varian, 301 Industrial Way, San Carlos, California 94070, for information and recommendations.

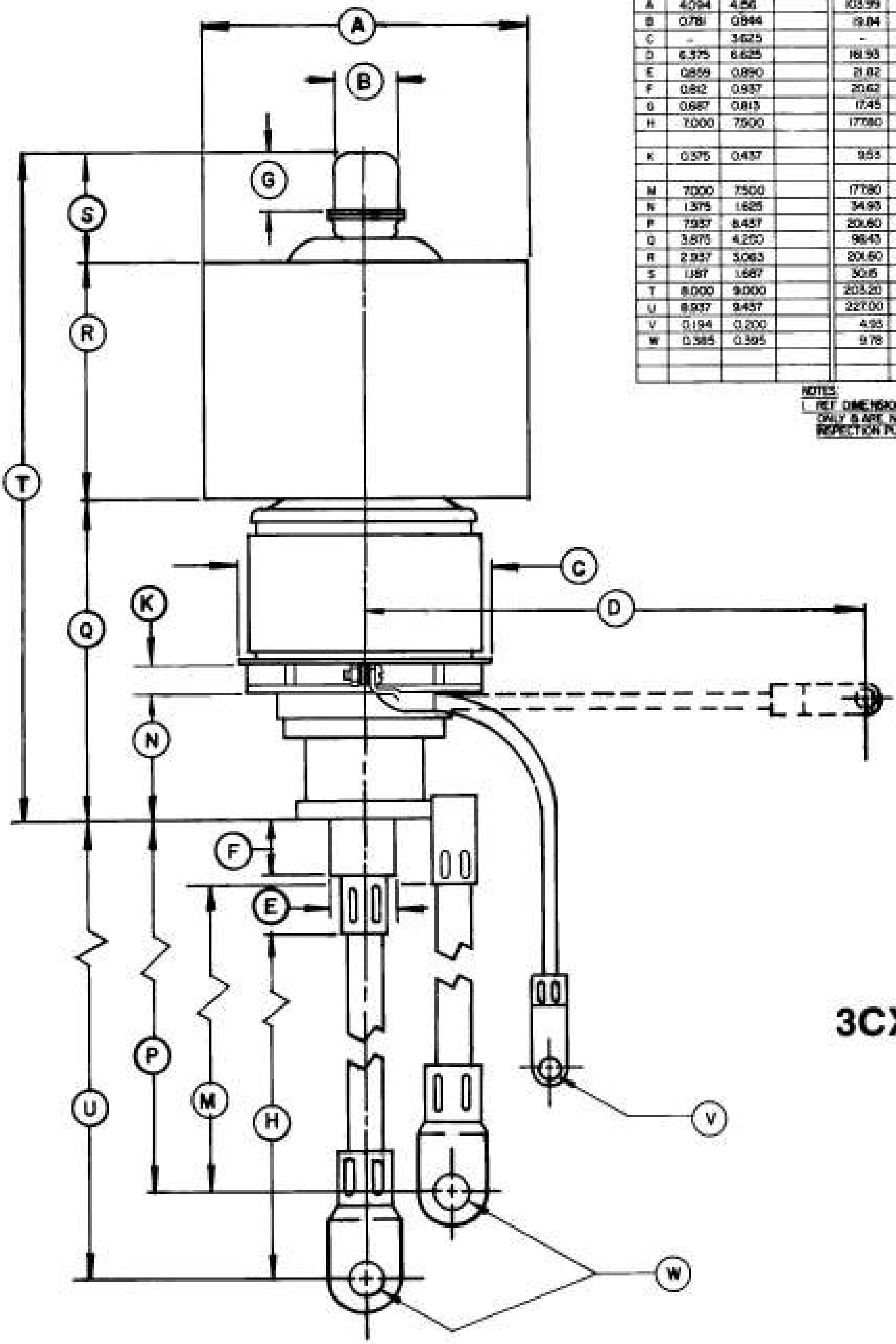


DIMENSIONAL DATA						
DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	4.094	4.156	- -	103.99	105.56	- -
B	0.781	0.844	- -	19.83	21.44	- -
C	2.990	3.010	- -	75.95	76.45	- -
D	0.615	0.635	- -	15.62	16.13	- -
E	1.490	1.510	- -	37.85	38.35	- -
F	- -	3.625	- -	- -	92.08	- -
G	0.813	0.937	- -	20.65	23.80	- -
H	1.375	1.625	- -	34.92	41.28	- -
J	0.391	0.422	- -	9.93	10.72	- -
K	3.875	4.250	- -	98.43	107.95	- -
L	2.937	3.063	- -	74.60	77.80	- -
N	1.187	1.687	- -	30.15	42.85	- -
P	8.000	9.000	- -	203.20	228.60	- -
Q	0.687	0.813	- -	17.45	20.65	- -

NOTES:
1. REF. DIMENSIONS ARE FOR INFO. ONLY & ARE NOT REQUIRED FOR INSPECTION PURPOSES.

3CX2500A3





DIMENSIONAL DATA

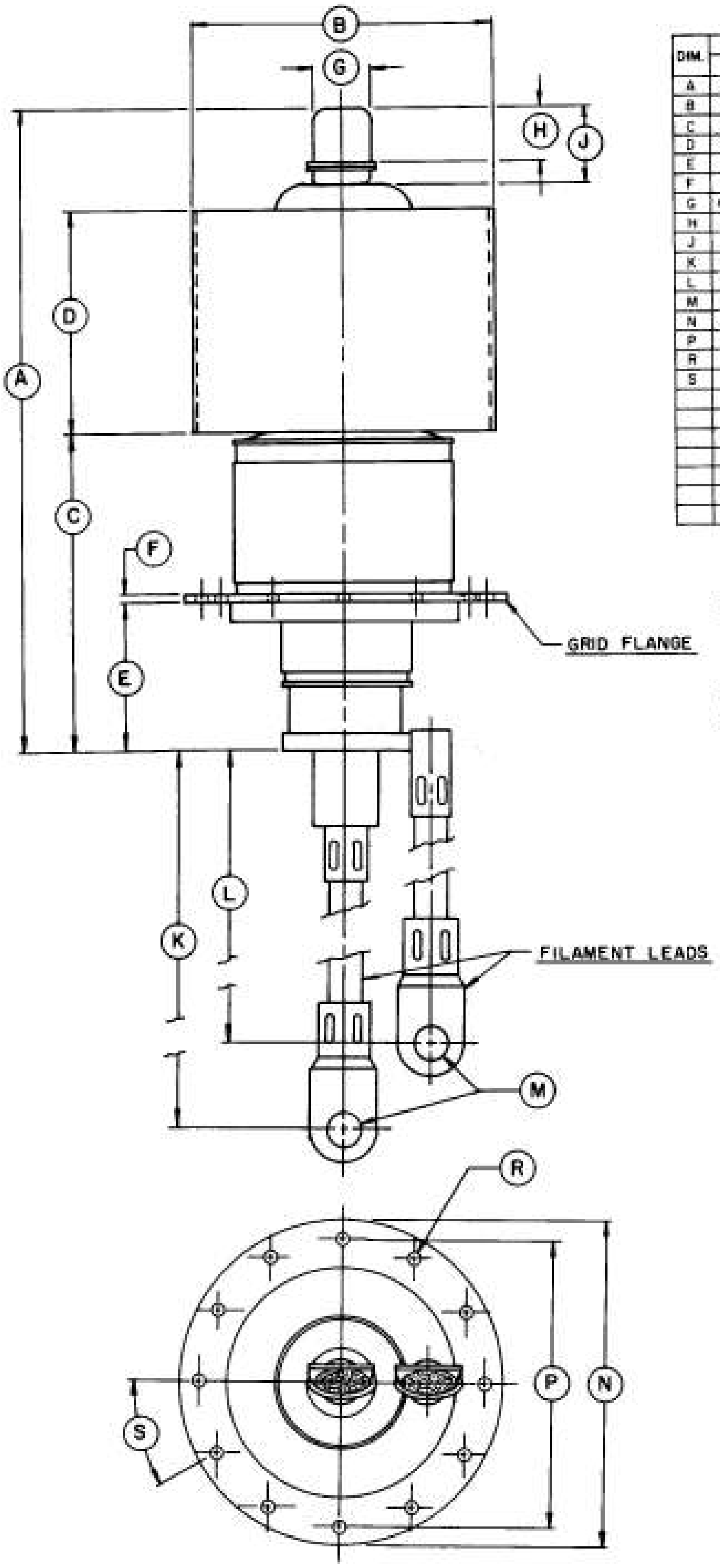
DIM	INCHES			MILLIMETERS		
	MIN	MAX	REF	MIN	MAX	REF
A	4.094	4.156		103.99	105.56	
B	0.781	0.844		19.84	21.44	
C	–	3.625		–	92.08	
D	6.375	6.625		161.93	168.28	
E	0.859	0.890		21.82	22.61	
F	0.812	0.937		20.62	23.80	
G	0.687	0.813		17.45	20.65	
H	7.000	7.500		177.80	190.50	
K	0.375	0.437		9.53	11.10	
M	7.000	7.500		177.80	190.50	
N	1.375	1.625		34.93	41.28	
P	7.937	8.437		201.60	214.30	
Q	3.875	4.250		98.43	107.95	
R	2.937	3.063		201.60	214.30	
S	1.187	1.687		30.15	42.85	
T	8.000	9.000		203.20	228.60	
U	8.937	9.437		227.00	239.70	
V	0.194	0.200		4.93	5.08	
W	0.385	0.395		9.78	10.03	

NOTES:
1. REF DIMENSIONS ARE FOR INFO. ONLY & ARE NOT REQUIRED FOR INSPECTION PURPOSES.

3CX2500F3

DIMENSIONAL DATA

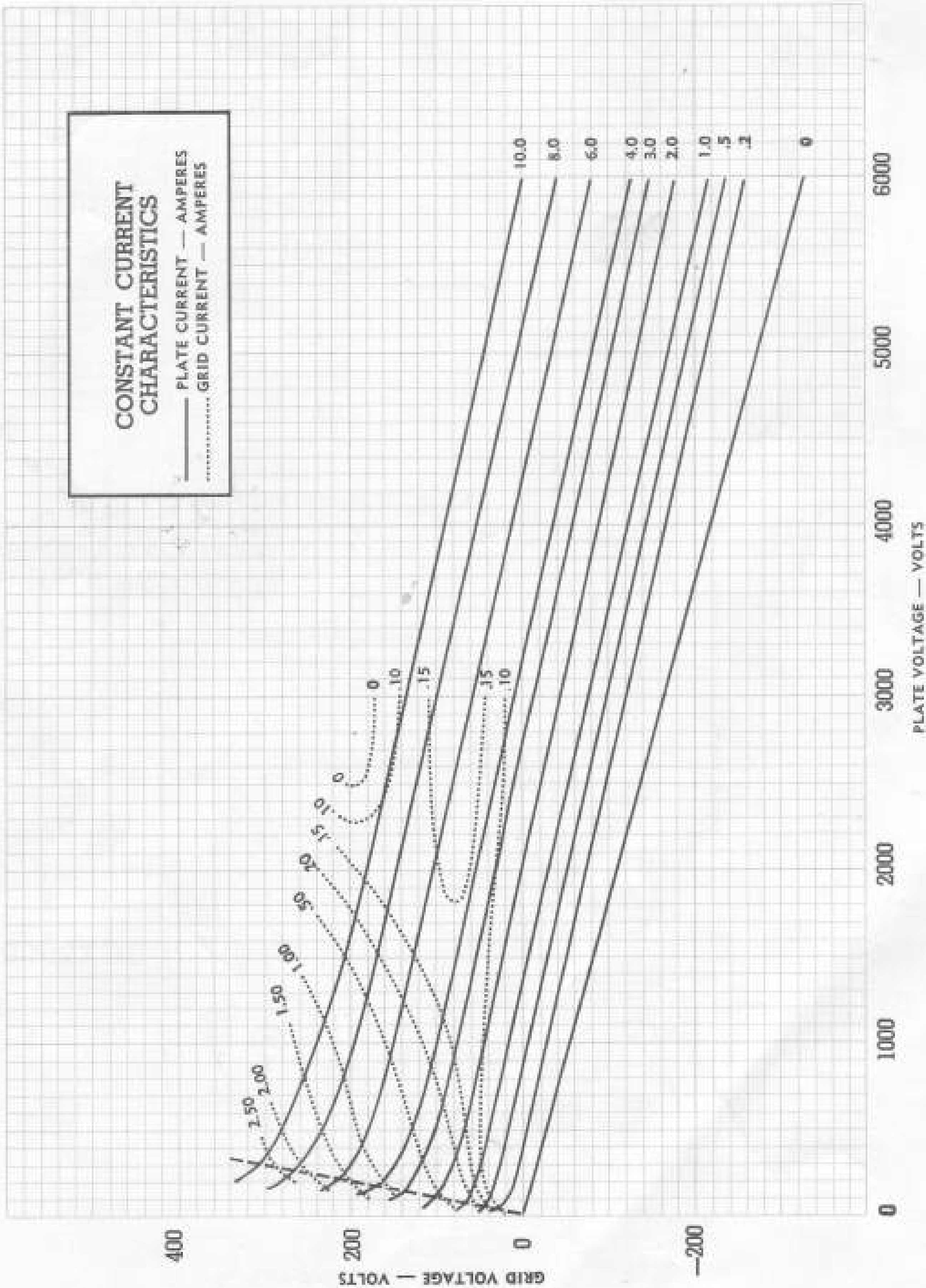
DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	8.000	9.000	- -	203.20	228.60	- -
B	4.093	4.156	- -	103.96	105.56	- -
C	3.875	4.250	- -	98.43	107.95	- -
D	2.937	3.062	- -	74.60	77.77	- -
E	1.703	1.953	- -	43.26	49.61	- -
F	- -	- -	0.125	- -	- -	3.18
G	0.781	0.843	- -	19.84	21.41	- -
H	0.687	0.812	- -	17.45	20.62	- -
J	1.000	1.125	- -	25.40	28.58	- -
K	8.937	9.437	- -	227.00	239.70	- -
L	7.937	8.437	- -	201.60	214.30	- -
M	- -	- -	0.390	- -	- -	9.91
N	4.230	4.250	- -	107.44	107.95	- -
P	3.855	3.885	- -	97.92	98.68	- -
R	- -	- -	0.250	- -	- -	6.35
S	29°	31°	- -	29°	31°	- -



NOTES:

1. REFERENCE DIMENSIONS ARE FOR INFORMATION ONLY AND ARE NOT REQUIRED FOR INSPECTION PURPOSES.
2. THERE ARE 12 HOLES IN GRID FLANGE.
3. GRID FLANGE AND FILAMENT LEADS ARE TO BE ORIENTED AS SHOWN.

3CX2500H3


CONSTANT CURRENT CHARACTERISTICS
—— PLATE CURRENT — AMPERES
.... GRID CURRENT — AMPERES
10.0
8.0
6.0
4.0
3.0
2.0
1.0
.5
.2
0
PLATE VOLTAGE — VOLTS
0
1000
2000
3000
4000
5000
6000
GRID VOLTAGE — VOLTS
400
200
0
-200
2.50
2.00
1.50
1.00
.50
.20
.15
.10