



## TECHNICAL DATA

# 3CW10,000H3

INDUSTRIAL  
MEDIUM-MU

WATER-COOLED  
POWER TRIODE

The EIMAC 3CW10,000H3 is a water-cooled, ceramic/metal power triode designed primarily for use in industrial radio-frequency heating services. Its water-cooled anode is conservatively rated at 10 kilowatts of plate dissipation with low water flow and pressure drop.

Input of 30 kilowatts is permissible up to 90 Megahertz. Plentiful reserve emission is available from its 560 watt filament. The grid structure is rated at 150 watts making this tube an excellent choice for severe applications.

### GENERAL CHARACTERISTICS<sup>1</sup>

#### ELECTRICAL

Filament: Thoriated Tungsten

Voltage . . . . .  $7.5 \pm 0.37$  V

Current, at 7.5 volts . . . . . 75 A

Amplification Factor (Average): . . . . . 20

Direct Interelectrode Capacitance (grounded cathode)<sup>2</sup>

Input . . . . . 53.0 pF

Output . . . . . 1.5 pF

Feedback . . . . . 25.0 pF

Frequency of Maximum Rating:

CW . . . . . 90 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.

#### MECHANICAL

Maximum Overall Dimensions:

Length (excluding leads) . . . . . 10.450 in; 265.43 mm

Diameter . . . . . 5.090 in; 129.29 mm

Net Weight . . . . . 10 lb; 4.54 kg

Operating Position . . . . . Vertical, base down or up

Maximum Operating Temperature:

Ceramic/Metal Seals . . . . . 250 °C

Cooling . . . . . Water and Forced Air

Base . . . . . See Outline



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**RADIO FREQUENCY INDUSTRIAL OSCILLATOR**

Class C (Filtered DC Power Supply)

(Key-Down Conditions)

**ABSOLUTE MAXIMUM RATINGS**

DC PLATE VOLTAGE	10,000 VOLTS
DC GRID VOLTAGE	-1000 VOLTS
DC PLATE CURRENT	3.0 AMPERES
DC GRID CURRENT	0.5 AMPERE
PLATE INPUT POWER	30,000 WATTS
PLATE DISSIPATION	10,000 WATTS

**TYPICAL OPERATION (Frequencies to 90 MHz)<sup>2</sup>**

Plate Voltage	7000	9000	Vdc
Grid Voltage	-700	-900	Vdc
Plate Current	2.88	2.90	Adc
Grid Current <sup>1</sup>	0.18	0.18	Adc
Peak rf Grid Voltage <sup>1</sup>	250	250	v
Calculated Driving Power	170	215	W
Plate Input Power	20.15	26.10	kW
Plate Dissipation	5.15	5.50	kW
Plate Output Power	15.0	20.6	kW
Resonant Load Impedance	1120	1470	$\Omega$

1. Approximate value.

2. Loaded Conditions

NOTE: TYPICAL OPERATION data are obtained by calculation from published characteristic curves or actual measurement. 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.	Max.	
Filament: Current at 7.5 volts	72	77	A
Interelectrode Capacitances <sup>1</sup> (grounded filament connection)			
Input	46.0	56.0	pF
Output	1.35	1.65	pF
Feedback	22.0	28.0	pF

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

**APPLICATION****MECHANICAL**

**MOUNTING** - The 3CW10,000H3 must be mounted vertically, either base up or down. A grid contact flange is provided for bolting to a strap or a grid deck. Heavy flexible leads are provided for applying the filament voltage.

**COOLING** - Anode cooling is accomplished by circulating water through the integral anode-water jacket.

The table below lists minimum water flow requirement for adequate anode cooling at various plate dissipation levels. In all cases, the outlet water temperature must not exceed 70°C

nor should inlet water pressure exceed 60 psi. This table is based upon 15°C temperature rise of water from inlet to outlet.

MINIMUM WATER-COOLING REQUIREMENT		
Plate Dissipation (kW)	Water Flow (gpm)	Pressure Drop (psi)
8	3.2	5.5
10	4.4	8.1
12	5.8	13.4

Additional stem cooling air must be provided. 8 CFM of air directed against the center filament contact ring  $\frac{1}{2}$  inch below the outer filament contact ring by a  $1\frac{1}{2}$  inch I.D. air duct arranged at a  $45^\circ$  angle with the center line of the tube will provide adequate cooling.

## ELECTRICAL

**FILAMENT** - The rated filament voltage for the 3CW10,000H3 is 7.5 volts. Filament voltage, as measured at the tube, must be maintained at 7.5 volts plus or minus five percent for maximum tube life and consistent performance.

**GRID OPERATION** - The grid current rating is 0.5 ampere dc. This value should not be exceeded for more than very short periods such as during tuning. Over-current protection in the grid circuit should be provided. Ordinarily it will not be necessary to operate with more than 0.25 ampere grid current to obtain reasonable efficiency. In industrial heating service with varying loads, grid current should be monitored continuously with a dc current meter. The maximum grid dissipation rating is 150 watts.

**PLATE OPERATION** - Plate over-current protection should be provided to remove plate voltage quickly in the event of an overload or an arc-over at the load. In addition current limiting power supply resistors should be used. These precautions are especially important in industrial service with its wide variations in loading.

**HIGH VOLTAGE** - The 3CW10,000H3 operates at voltages which can be deadly, and the equipment must be designed properly and operating precautions must be followed. Equipment must be designed 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 the primary circuits of the power supplies and to dis-

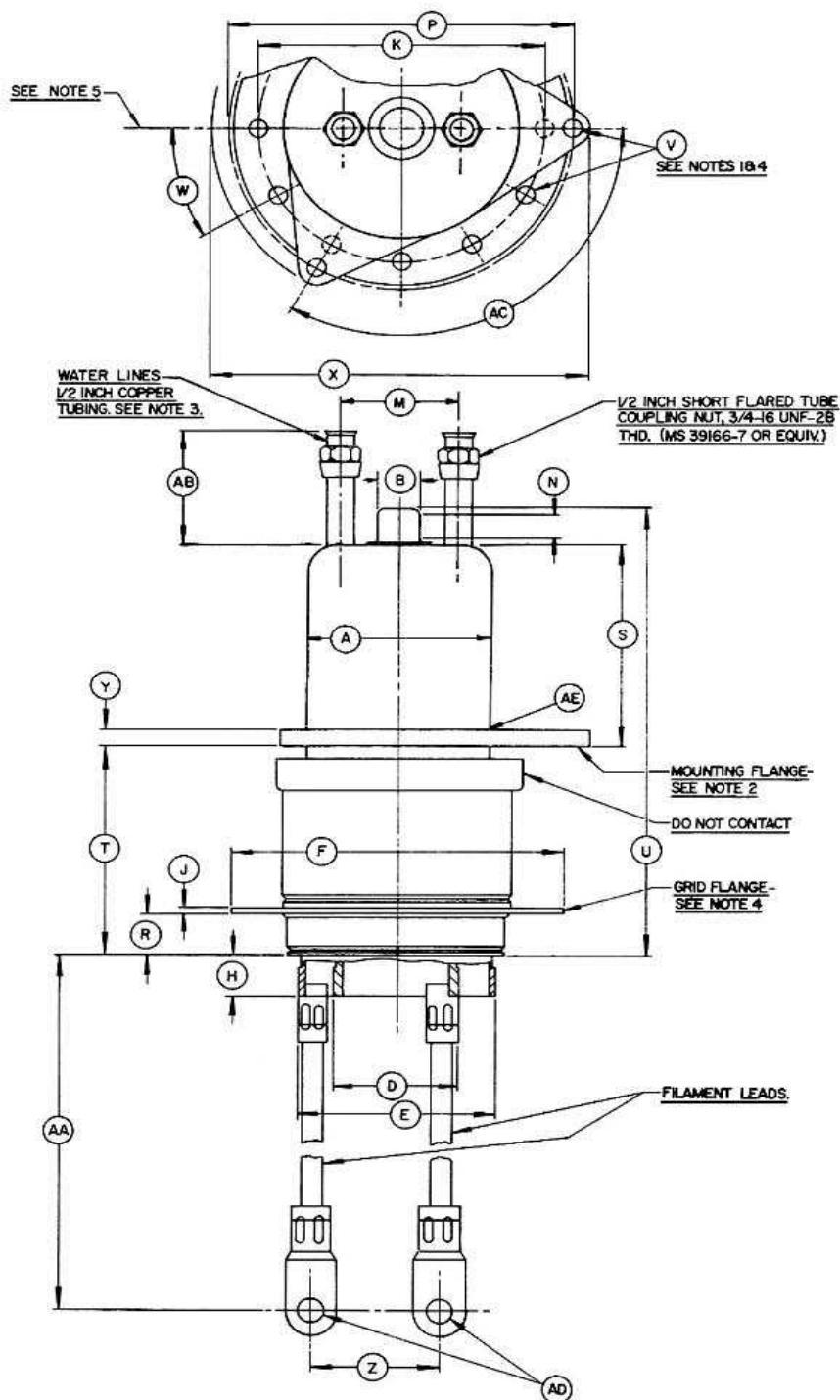
charge high voltage condensers whenever access doors are opened. Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that HIGH VOLTAGE CAN KILL.

**X-RAY RADIATION** - The 3CW10,000H3, operating at its maximum rated voltage and current, as an industrial oscillator is a potential X-ray hazard. Moreover, the X-ray radiation level can increase significantly with aging and gradual deterioration, due to changes in leakage paths or emission characteristics as they are affected by high voltage. Only limited shielding is afforded by the tube envelope. Additional X-ray shielding must be provided on all sides of the tube to provide adequate protection to operating personnel throughout the tube's life. X-ray caution signs or labels must be permanently attached to equipment using this tube directing operating personnel never to operate this device without X-ray shielding in place.

**RADIO FREQUENCY RADIATION** - Exposure of the human body to rf radiation becomes increasingly more hazardous as the power level and/or frequency are increased. Exposure to high-power rf radiation must be strictly prevented at any frequency.

Equipment must be designed to fully safeguard all personnel from these hazards. Labels and caution notices must be provided on equipment and in manuals clearly warning of these hazards.

**SPECIAL APPLICATIONS** - If it is desired to operate this tube under conditions widely different from those given 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	2.830	3.030	--	71.88	76.96	--
B	0.860	0.890	--	21.84	22.61	--
D	--	--	1.875	--	--	47.63
E	--	--	3.250	--	--	82.55
F	5.030	5.090	--	127.76	129.29	--
H	0.530	0.700	--	13.46	17.78	--
J	--	--	0.125	--	--	3.18
K	4.425	4.445	--	112.40	112.90	--
M	--	--	1.900	--	--	48.26
N	0.375	--	--	9.53	--	--
P	5.990	6.010	--	152.15	152.65	--
R	0.700	0.860	--	17.78	21.84	--
S	--	--	3.350	--	--	85.09
T	4.000	4.150	--	101.60	105.41	--
U	8.000	8.400	--	203.20	213.36	--
V	--	--	0.265	--	--	6.73
W	29°	31°	--	29°	31°	--
X	6.700	6.800	--	170.18	172.72	--
Y	--	--	0.250	--	--	6.35
Z	--	--	2.000	--	--	50.80
AA	8.500	9.000	--	215.90	228.60	--
AB	--	--	2.250	--	--	57.15
AC	118°	122°	--	118°	122°	--
AD	--	--	0.390	--	--	9.91
AE	--	--	0.062R	--	--	1.57R

## NOTES

1. REF. DIMS. ARE FOR INFO. ONLY  
8 ARE NOT FOR INSPECTION  
PURPOSES.
2. 3 MOUNTING HOLES IN MTG.  
FLANGE.
3. EITHER FITTING CAN BE USED  
AS INLET OR OUTLET.
4. 12 HOLES IN GRID FLANGE.
5. MTG. FLANGE, FIL. LEADS 8  
WATER FITTING ARE TO BE  
ORIENTED AS SHOWN.



