TH 491H TETRODE HYPERVAPOTRON

The TH 491H is a ceramic-metal, high power transmitting vapor cooled tetrode with integral boiler-condenser. It can be used as a C.W. oscillator or a grounded grid RF amplifier at frequencies up to 1000 MHz.

The TH 491H is especially intended for use in modulated RF power amplifier in broadband television transmitter.

The anode cooler of special design (THOMSON patents) can dissipate 30 kW. The corresponding energy can be transferred by vaporization and immediate condensation to a distilled water circuit which can reach 100 °C. It can be used at a high temperature in a secondary circuit.

GENERAL CHARACTERISTICS

Electrical

Type of cathode	thoriated tungsten	
Heating	direct	
Filament voltage (1) - (2)	5.2 ± 2 %	V
Filament current, approx.	180	A
Peak cathode current	40	A
Interelectrode capacitance (grounded grid operation) :		
- input (g2 tied to g1)	110	pF
- output (g2 tied to g1)	23	pF
- cathode - anode	< 0.1	pF
Amplification factor g1 - g2 avg.	4.5	
Transconductance (for I_a = 5 A)	100	mA/V

Mechanical

Operating position	vertical, anode up	
Anode cooling	high temperature anode cooling	
Maximum anode dissipation in CW operation	30	kW
Minimum waterflow	18	l/mn
Maximum temperature of inlet water	75	°C
Maximum temperature of outlet water	100	°C
Total pressure drop (boiler-condenser + 2 locking connectors)	1.2	bar
Maximum allowable pressure at the entrance of the cooling system	4	bar
Electrode terminal cooling	forced air	
Minimum airflow for envelope and electrode terminal cooling (3)	4	m^3/mn
Maximum temperature at any point of ceramic insulators (4)	250	° C
Net weight, approx.	16	kg
Dimensions	see drawing	

(1) For heater voltage application, see note page 3.

(2) In high frequency operation, the cathode is subjected to considerable back bombardment, which raises its temperature. After the circuit has been adjusted for proper tube operation, the heater voltage must be reduced to prevent over-heating of the cathode with resulting short life.

(3) For 30 °C incoming air temperature.

(4) It is necessary to provide air cooling for tube terminals and insulators. This air flow must be established before application of any electrode voltage and maintained during 3 minutes at least after heater voltage has been removed.

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GROUPEMENT TUBES ELECTRONIQUES

CLASS B TELEVISION - MODULATED R.F. POWER AMPLIFIER

GROUNDED GRID - BANDS IV and V

I - Maximum ratings (reference potential : cathode potential)

DC anode voltage	6	kV
DC grid g2 voltage	600	V
DC grid g1 voltage	250	V
Peak cathode current	40	A
DC anode current	10	A
Anode dissipation	30	kW
Grid g2 dissipation	200	W
Grid g1 dissipation	100	W
Frequency	870	MHz

II - Typical operation (reference potential : cathode potential)

POSITIVE GRID MODULATION AND NEGATIVE SYNCHRONIZATION

- all data given at white level

Frequency	700	MHz
Bandwidth	10	MHz
DC anode voltage	5.5	kV
DC grid g2 voltage	400	V
DC grid g1 voltage	− 150	V
Average anode current	7.3	A
Average grid g2 current	80	mA
Average grid g1 current	450	mA
Driving power	1500	W
Peak driving power	1900	W
Load output power	20	kW
Load peak output power	25	kW

NEGATIVE GRID MODULATION AND POSITIVE SYNCHRONIZATION

Frequency	620	MHz
Bandwidth	10	MHz
DC anode voltage	5.5	kV
DC grid g2 voltage	400	V
DC grid g1 voltage	−150	V
DC anode current :		
- synchronization level	8.2	A
- pedestal level*	6.2	A
DC grid g2 current, approx.:		
- synchronization level	130	mA
- pedestal level*	60	mA
DC grid g1 current, approx.:		
- synchronization level	480	mA
- pedestal level*	240	mA
Driving power, approx. :		
- synchronization level	1800	W
- pedestal level*	1100	W
Load output power (5) :		
- synchronization level	25	kW
- pedestal level*	15	kW

(5) The load is directly connected to amplifier output.

* Without signal.

TUBE PROTECTION AND FEEDING INSTRUCTIONS

In order to achieve long tube life, maximum operating efficiency and circuit stability consistent with the full tube capability, the following instructions should be strictly observed.

I - ELECTRODES FEEDING ORDER -

Apply successively :

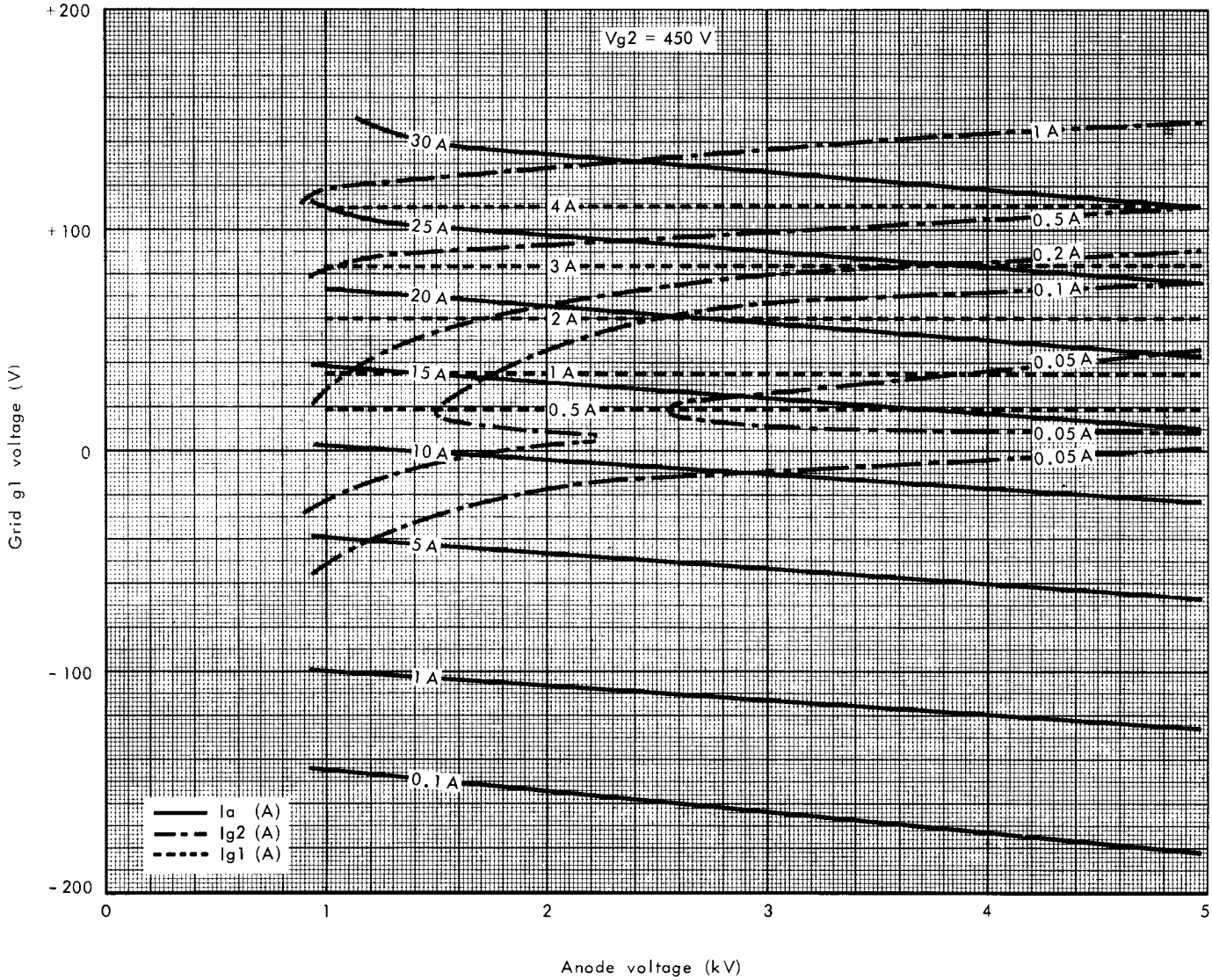
1 - $\frac{1}{2}$ V_f (filament voltage) during 60 seconds ;
2 - Nominal V_f during 60 seconds ;
3 - Grid bias ;
4 - Anode voltage ;
5 - Screen voltage ;
6 - Driving voltage.

II - SECURITY DEVICES AGAINST ANODE, SCREEN, GRID OVERCURRENTS -

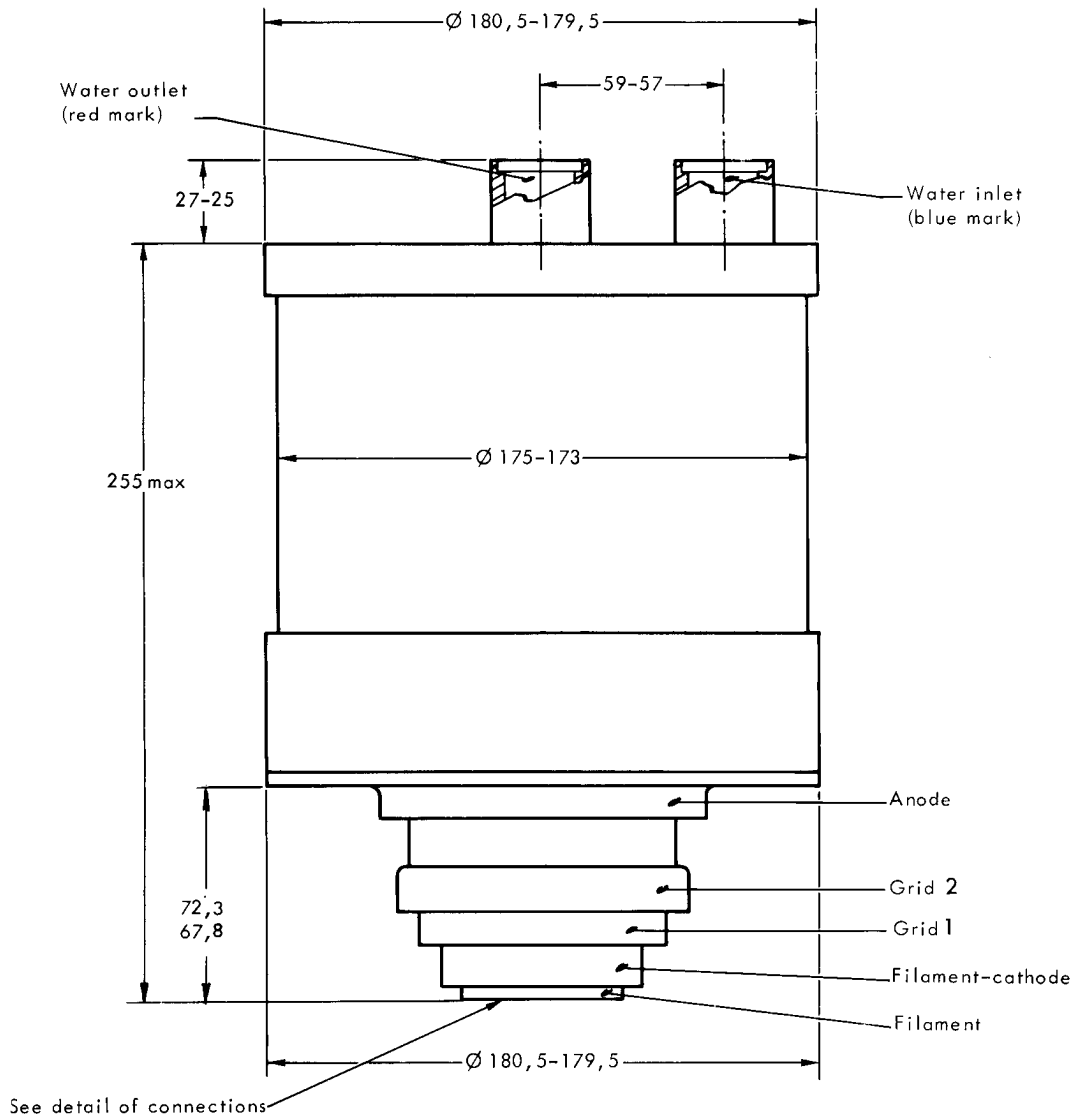
1 - Overcurrents due to unproper utilisation conditions : the protection can be achieved by 3 relays inserted in series, respectively in grid, screen and anode circuits. These relays are adjusted so as to operate when currents equal to 1.5 Imax. are attained, Imax. being the normal current in the considered operating conditions. When one of these relays operate, the driving voltage and the screen and anode voltages must be simultaneously cut-off.

2 - Overcurrents due to stray oscillations or electrode arcings : the protection can be achieved by 3 short-response security devices (grid, screen, anode) acting for currents equal to 5 Imax., Imax. being the normal current in the considered operating conditions. Each of these 3 systems acting on the 2 others must cause the short-circuit of the driving, screen and anode voltages and eventually the grid bias voltage with a total delay lower than 30 microseconds.

CONSTANT CURRENT CHARACTERISTICS

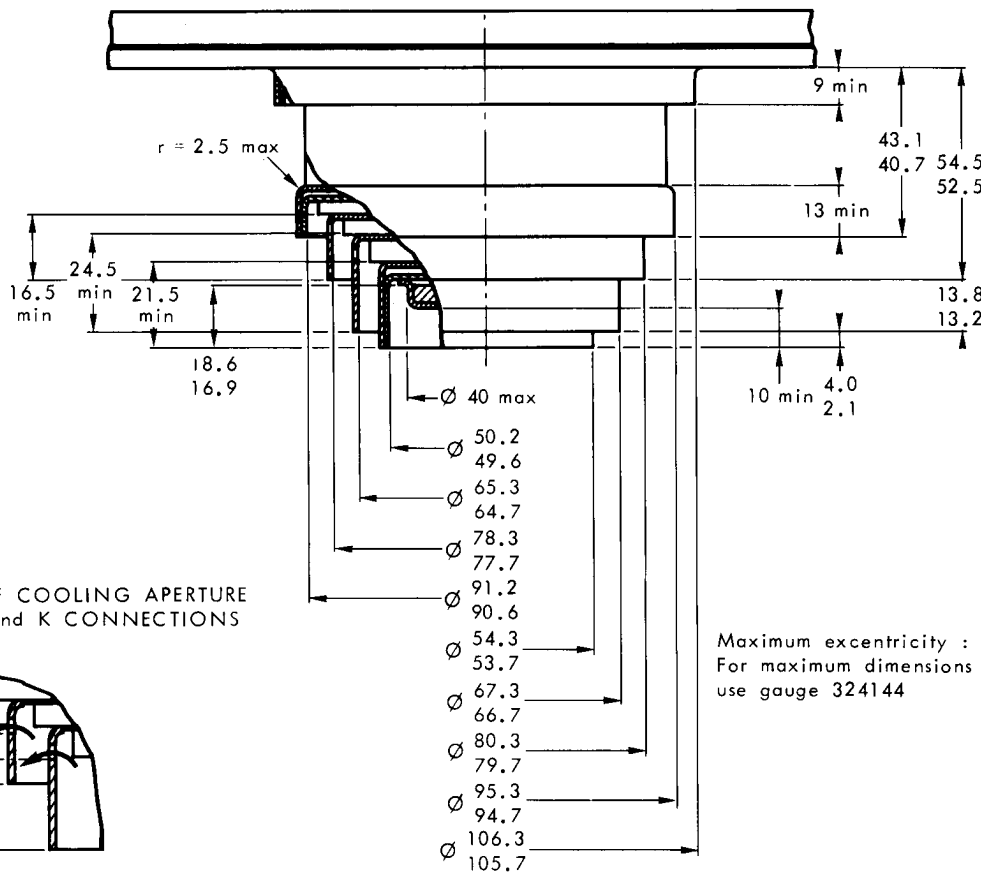


OUTLINE DRAWING

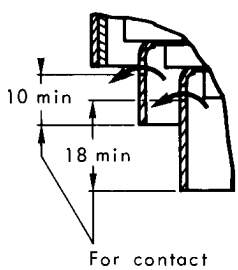


Dimensions in mm.

DETAILS OF ELECTRODE TERMINALS

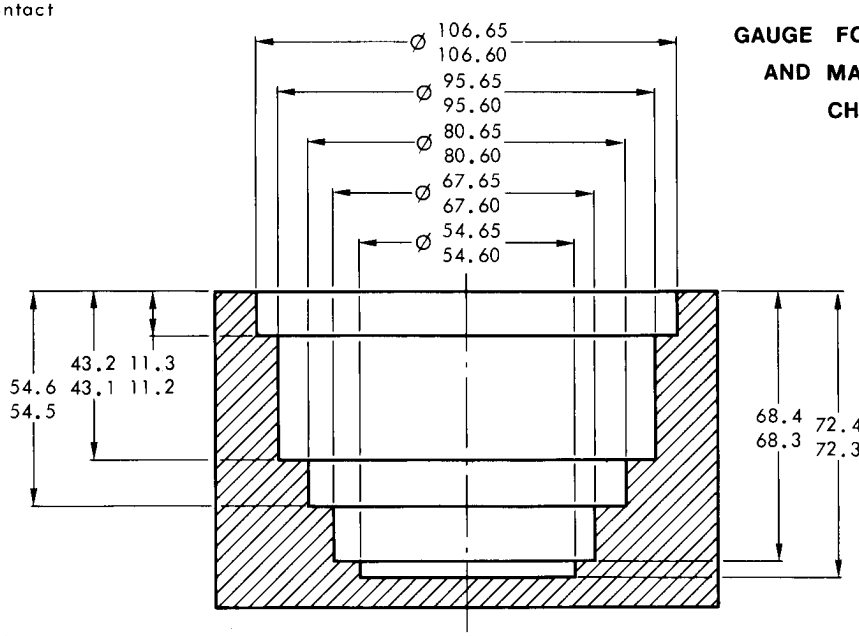


DETAIL OF COOLING APERTURE ON G1 and K CONNECTIONS



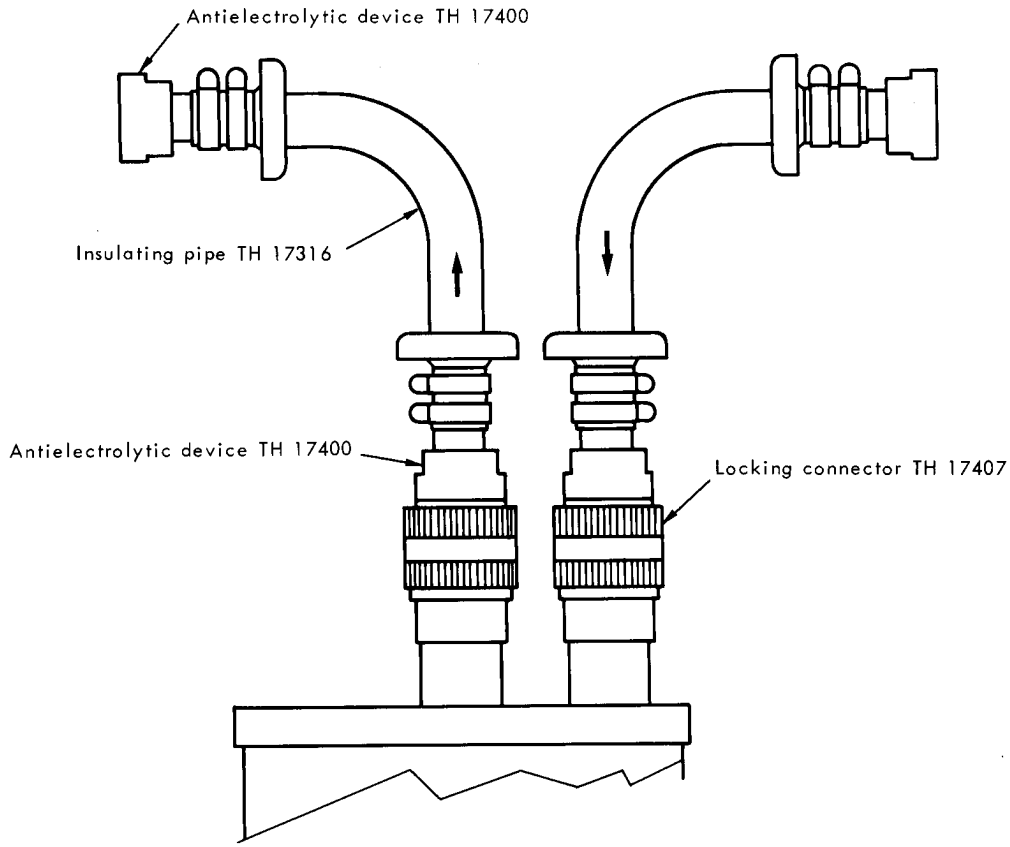
Maximum excentricity : 0.3
For maximum dimensions checking, use gauge 324144

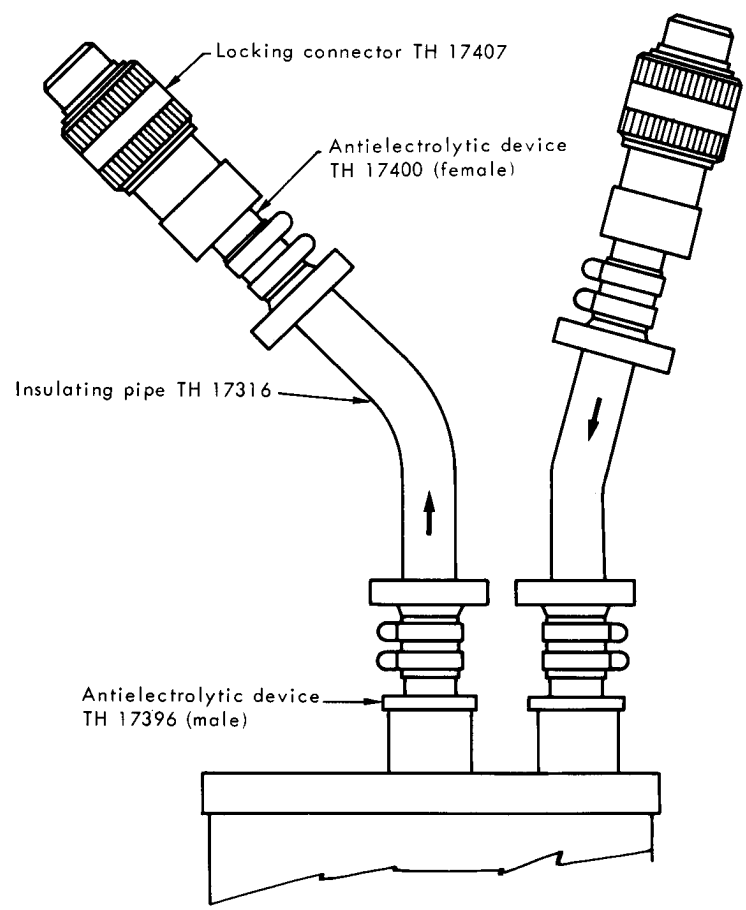
GAUGE FOR EXCENTRICITY AND MAX. DIMENSIONS CHECKING



Dimensions in mm.

COOLING SYSTEM CONNECTION





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