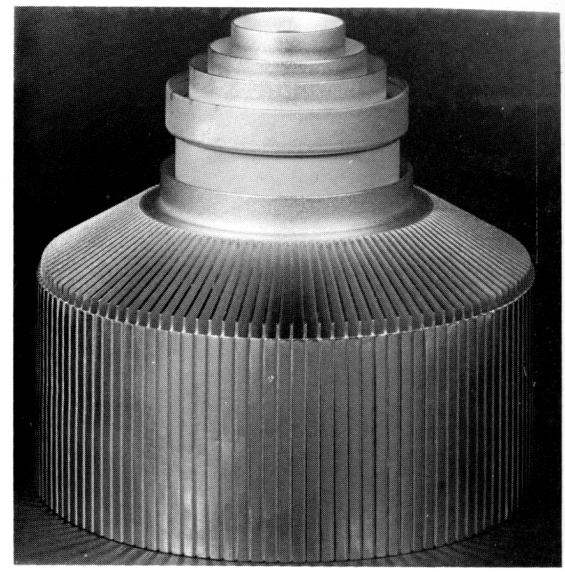
TH 392 TETRODE



The TH 392 is a forced air cooled ceramic metal tetrode of coaxial structure. It can be used as a CW oscillator or grounded grid RF power amplifier at frequencies up to 1000 MHz.

Incorporating the latest technological innovation, the PYROBLOC grid (THOMSON-CSF Registered Trade Mark) the TH 392 is able to operate at high power levels with increased stability, reliability and operating life.

The anode can dissipate 12 kW.

The TH 392 is well adapted to RF power amplifier in broadband Television transmitter as well as in FM services.

GENERAL CHARACTERISTICS

Electrical

Type of cathode	thoriated tungsten	
Heating	direct	
Heater voltage (1) - (2)	4.2 ± 2 %	V
Heater current, approx.	140	A
Peak cathode current	25	A
Interelectrode capacitance :		
- input (g2 tied to g1)	75	pF
- output (g2 tied to g1)	17.5	pF
- cathode - anode	0.01	pF
Amplification factor g1 - g2 avg.	6	
Transconductance	70	mA/V

Mechanical

Mounting position	vertical	
Anode cooling	forced air	
Minimum airflow (3)	13	m^3/mn
Corresponding pressure drop	8	millibar
Maximum inlet air temperature	45	°C
Maximum outlet air temperature	100	°C
Maximum temperature (4)	250	°C
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) 30 °C incoming air temperature 12 kW anode dissipation.

(4) At any point of ceramic insulators. 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.

CLASS B TELEVISION - RF POWER AMPLIFIER

POSITIVE GRID MODULATION AND NEGATIVE SYNCHRONIZATION
GROUNDED GRIDS

Maximum ratings (All potentials referred to cathode potential)

DC anode voltage	5.2	kV	Anode dissipation	12	kW
DC grid g2 voltage	400	V	Grid g2 dissipation	150	W
DC grid g1 voltage	−250	V	Grid g1 dissipation	50	W
Peak cathode current	25	A	Frequency	1000	MHz
DC anode current	6	A			

Typical operation (All data given at permanent white level and without synchronization)

Frequency	860	MHz	DC anode current	4.8	A
Bandwidth	10	MHz	DC grid g2 current	50	mA
DC anode voltage	4.5	kV	DC grid g1 current	450	mA
DC grid g2 voltage	325	V	Driving power, approx.	1000	W
DC grid g1 voltage	−75	V	Anode dissipation, approx.	10.5	kW
			Load output power (1)	10	kW

(1) Including power transferred from driver stage and 0.7 dB losses in output circuits.

CLASS B TELEVISION - RF POWER AMPLIFIER

NEGATIVE GRID MODULATION AND POSITIVE SYNCHRONIZATION
GROUNDED GRIDS

Maximum ratings (All potentials referred to cathode potential)

DC anode voltate	5.2	kV	Anode dissipation	12	kW
DC grid g2 voltage	400	V	Grid g2 dissipation	150	W
DC grid g1 voltage	−250	V	Grid g1 dissipation	50	W
Peak cathode current	25	A	Frequency	1000	MHz
DC anode current	6	A			

Typical operation

Frequency	860	MHz	DC grid g2 current		
Bandwidth	7	MHz	- synchronizing level	50	mA
DC anode voltage	5	kV	- pedestal level	25	mA
DC grid g2 voltage	320	V	DC grid g1 current		
DC grid g1 voltage	−80	V	- synchronizing level	500	mA
DC anode current			- pedestal level	100	mA
- synchronizing level	4.8	A	Driving power, approx.		
- pedestal level	3.6	A	- synchronizing level	1000	W
			- pedestal level	600	W
			Load output power, approx. (1)		
			- synchronizing level	12	kW
			- pedestal level	7.2	kW

(1) Including power transferred from driver stage and 0.7 dB losses in output circuits.

CLASS B NARROW BAND FM SERVICE - RF POWER AMPLIFIER

GROUNDED GRIDS

Maximum ratings (All potentials referred to cathode potential)

DC anode voltage	5. 2	kV	Anode dissipation	12	kW
DC grid g2 voltage	400	V	Grid g2 dissipation	150	W
DC grid g1 voltage	–250	V	Grid g1 dissipation	50	W
Peak cathode current	25	A	Frequency	1000	MHz
DC anode current	6	A			

Typical operation

DC anode voltage	5	kV	DC anode current	4	A
DC grid g2 voltage	300	V	Driving power	900	W
DC grid g1 voltage	–80	V	Anode dissipation, approx.	9	kW
			Load output power (1)	10	kW

(1) Including power transferred from driver stage and 0. 7 dB losses in output circuits.

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.

1 - ELECTRODES FEEDING ORDER - Apply successively :

a - $\frac{1}{2}$ V_f (filament voltage) during 60 seconds

b - Nominal V_f during 60 seconds

c - Grid bias

d - Anode voltage

e - Screen voltage

f - Driving voltage

NOTA : A permanent 1.5 volt heater voltage during stand-by periods allows the immediate application of the sequence : nominal voltage V_f - grid bias - anode voltage - screen voltage - driving voltage.

2 - SECURITY DEVICES AGAINST ANODE, SCREEN, GRID OVERCURRENTS

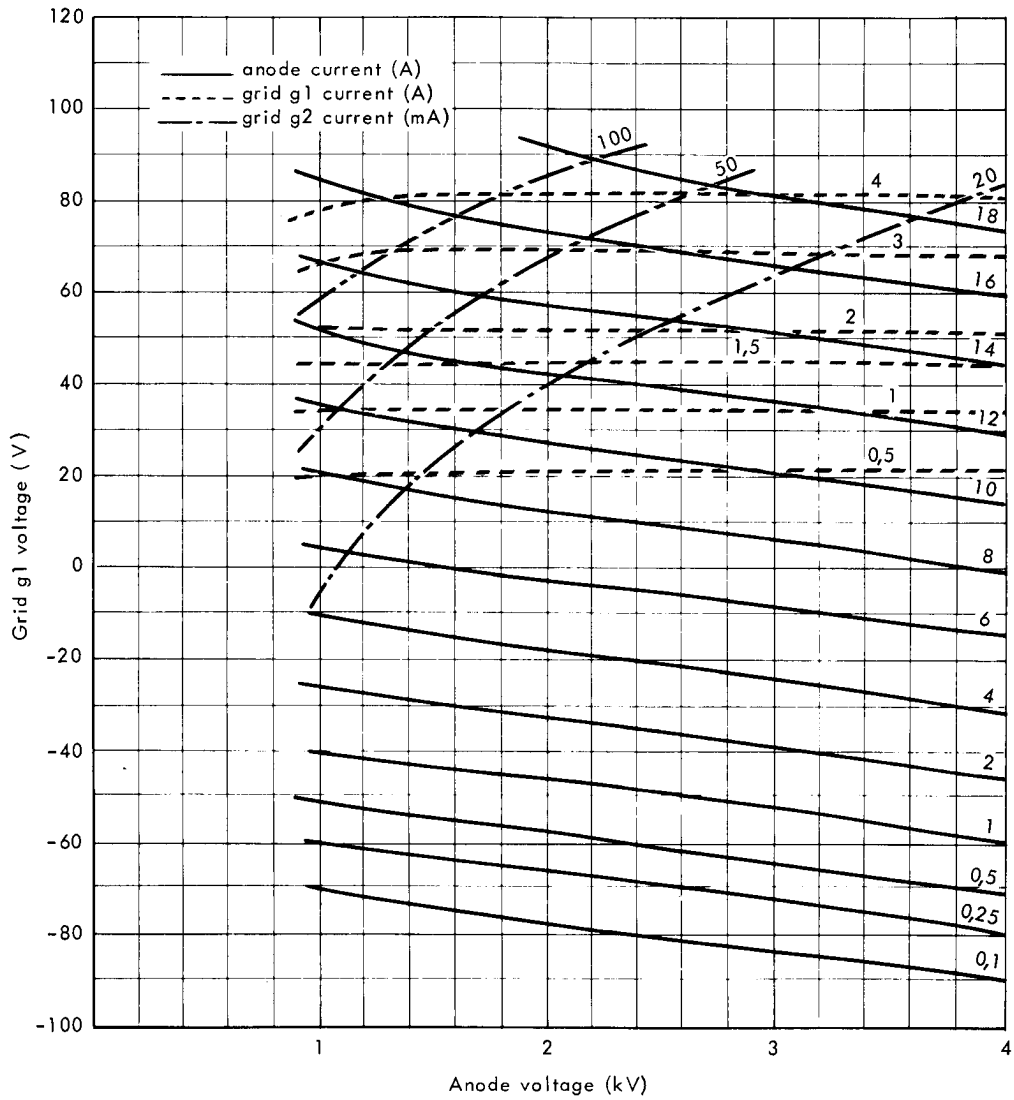
Overcurrents due to unproper utilisation conditions : the protection can be achieved by 3 relays inserted in series, respectively in grid, screen and anode circuits. These relays are adjusted so as to operate when currents equal to 1.5 Imax. are attained, Imax. being the normal current in the considered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

3 - MONITORING DEVICE FOR OVERTEMPERATURE OF OUTLET COOLING AIR

The temperature of outlet air coming from the anode cavity must not exceed 100 °C. The temperature rises when the cavity is not properly adjusted and it is necessary to provide a monitoring device so as to prevent the user from unproper adjustment. On the other hand, this device allows the user to be sure that the air evacuation system (generally made by the user) is well adapted to the equipment.

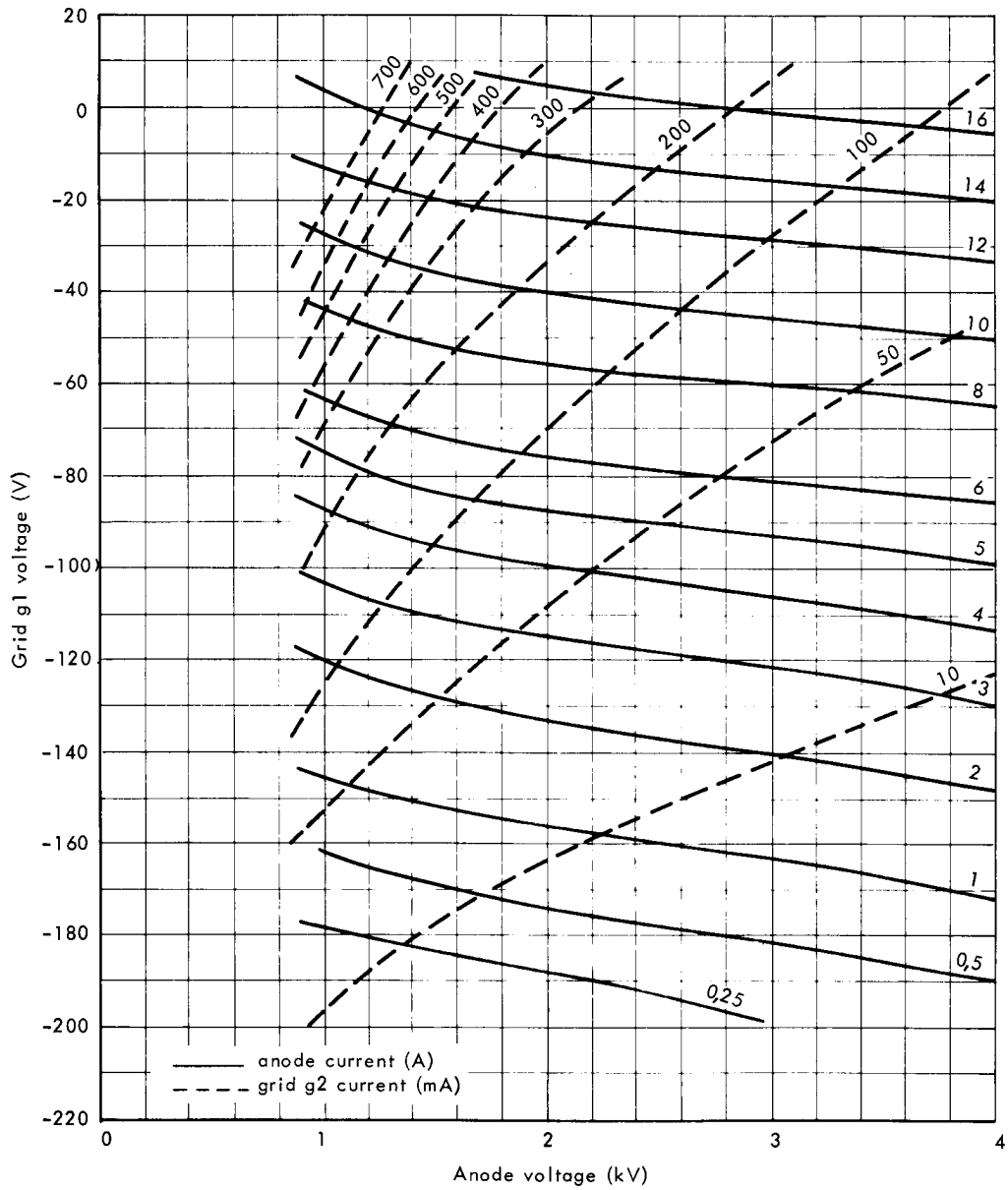
CONSTANT CURRENT CHARACTERISTICS

Vg2 = 300 V

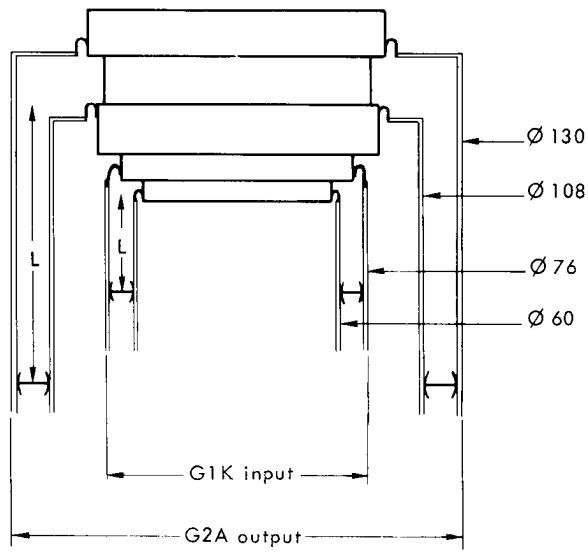


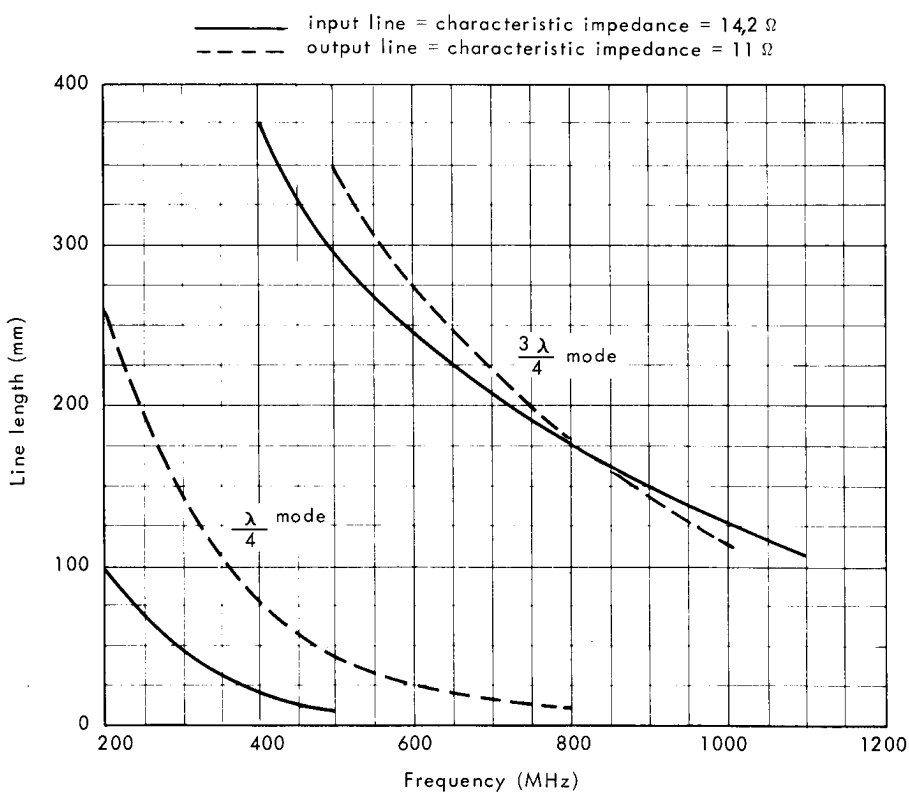
CONSTANT CURRENT CHARACTERISTICS

Vg2 = 800 V



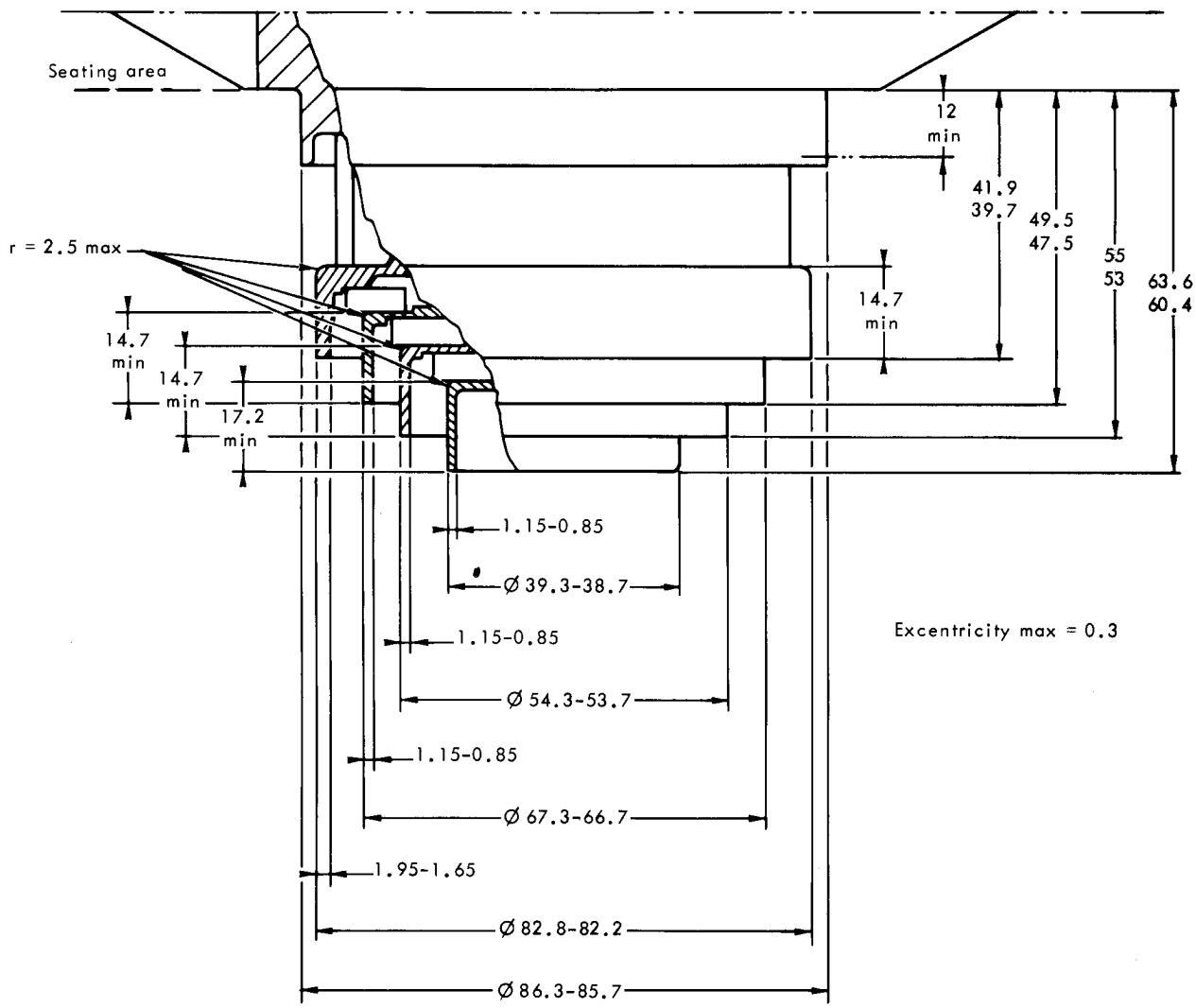
TUNING CURVES





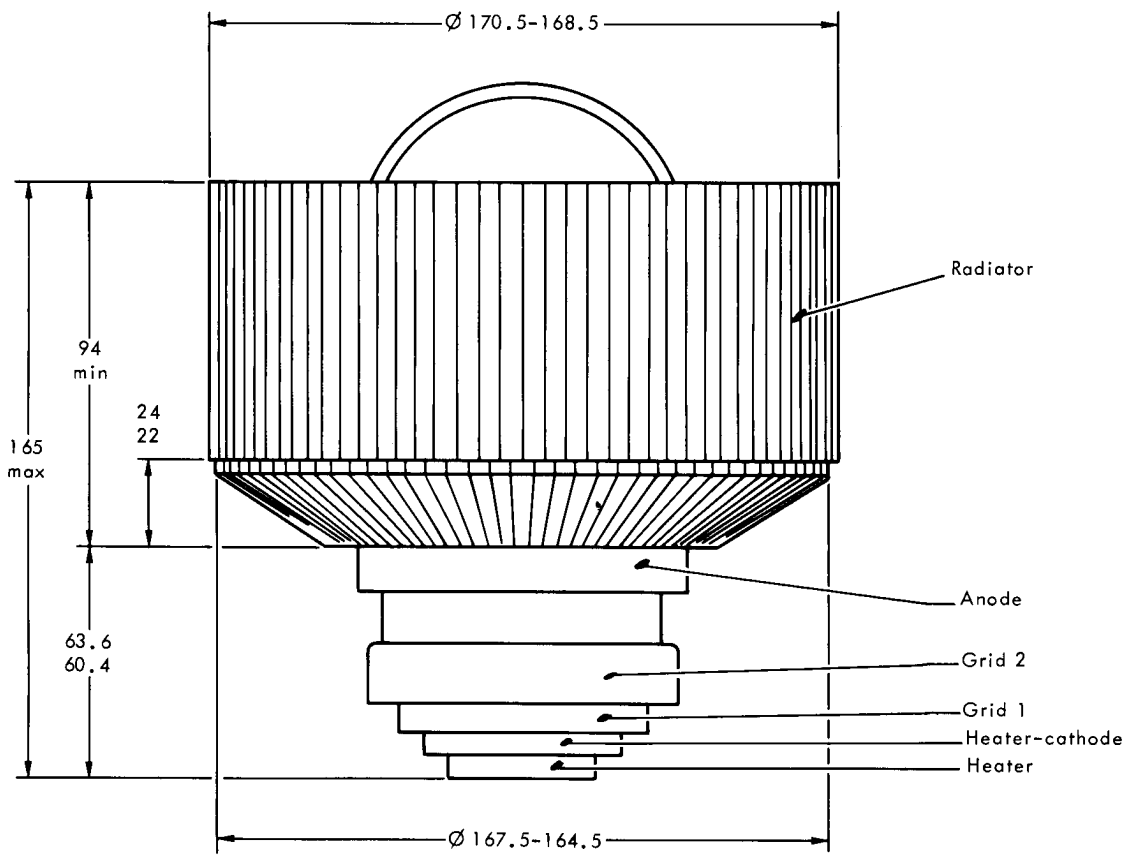
Dimensions in mm.

Details of electrode connections



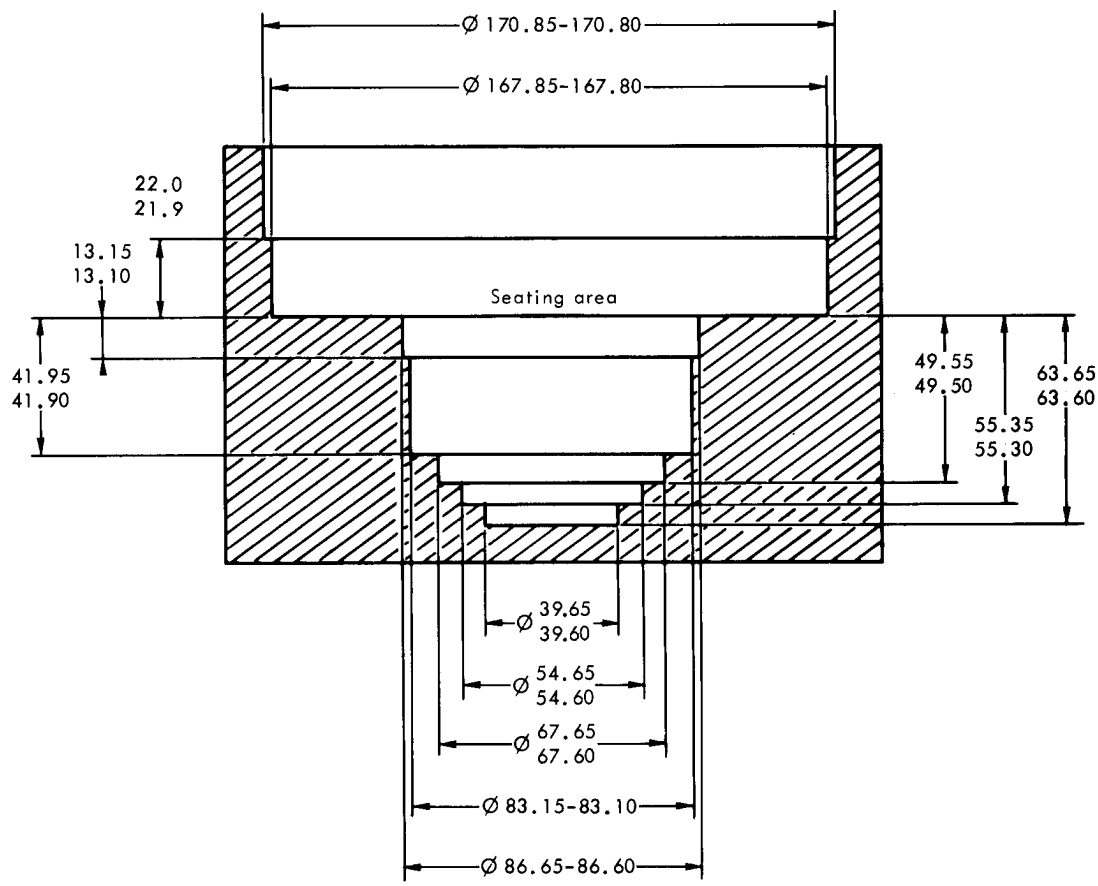
Dimensions in mm.

OUTLINE DRAWING



Dimensions in mm.

GAUGE

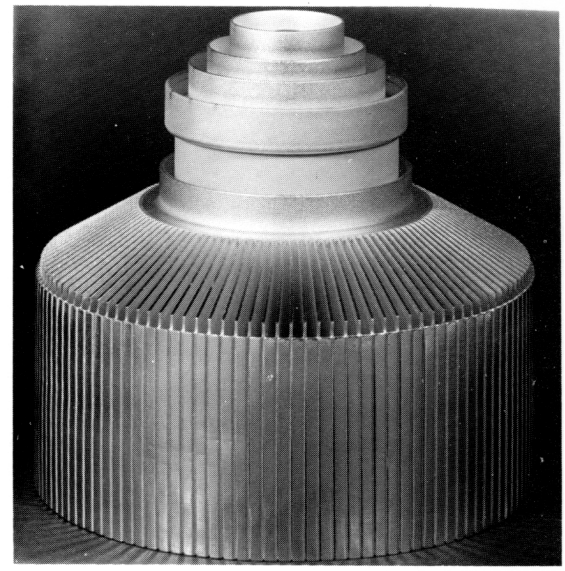


Dimensions in mm.

THOMSON-CSF

DIVISION TUBES ELECTRONIQUES

TH 392 TETRODE



The TH 392 is a forced-air cooled, ceramic/metal tetrode of coaxial structure. It can be used as a CW oscillator or grounded-grid RF power amplifier at frequencies up to 1000 MHz.

Incorporating advanced PYROBLOC® grids, the TH 392 is able to operate at high power levels with increased stability, reliability and operating life.

Its anode can dissipate 12 kW.

The TH 392 is well suited for use as an RF power amplifier in broadband television transmitters as well as in FM-radio service.

GENERAL CHARACTERISTICS

Electrical

Type of cathode	Thoriated tungsten	
Heating	Direct	
Filament voltage (1) - (2)	4.2 V ± 2 %	
Filament current, approx.	140	A
Peak cathode current	25	A
Interelectrode capacitances :		
- input (g2 connected to g1)	75	pF
- output (g2 connected to g1)	17.5	pF
- cathode-anode	0.01	pF
Amplification factor, g1 - g2, avg.	6	
Transconductance	70	mA/V

Mechanical

Mounting position	Vertical	
Anode cooling	By forced air	
Minimum airflow (3)	13	m^3/mn
Corresponding pressure drop	8	millibar
Maximum inlet air temperature	45	°C
Maximum outlet air temperature	100	°C
Maximum ceramic-insulator temperature (4)	250	°C
Dimensions	See the Outline Drawing	

(1) For filament voltage application, see 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 filament voltage must be reduced to prevent overheating of the cathode, which will shorten its emissive life.

(3) Inlet air temperature : 30 °C ; Anode dissipation : 12 kW.

(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 the filament voltage has been switched off.

CLASS B TELEVISION - RF POWER AMPLIFIER

POSITIVE GRID MODULATION AND NEGATIVE SYNCHRONIZATION
GROUNDED GRIDS

Maximum ratings (5) (All potentials referred to cathode potential)

Anode voltage	5. 2	kVdc	Anode dissipation	12	kW
Screen-grid (g2) voltage	400	Vdc	Grid g2 dissipation	150	W
Control-grid (g1) voltage	− 250	Vdc	Grid g1 dissipation	50	W
Peak cathode current	25	A	Frequency	1000	MHz
Anode direct current	6	A			

Typical operation (All data given at continuous white level and without synchronization)

Frequency	860	MHz	Anode direct current	4. 8	A
Bandwidth	10	MHz	Screen-grid direct current	50	mA
Anode voltage	4. 5	kVdc	Control-grid direct current	450	mA
Screen-grid voltage	325	Vdc	Driving power, approx.	1000	W
Control-grid voltage	− 75	Vdc	Anode dissipation, approx.	10. 5	kW
			Load output power (6)	10	kW

CLASS B TELEVISION - RF POWER AMPLIFIER

NEGATIVE GRID MODULATION AND POSITIVE SYNCHRONIZATION
GROUNDED GRIDS

Maximum ratings (5) (All potentials referred to cathode potential)

Anode voltage	5. 2	kVdc	Anode dissipation	12	kW
Screen-grid (g2) voltage	400	Vdc	Grid g2 dissipation	150	W
Control-grid (g1) voltage	− 250	Vdc	Grid g1 dissipation	50	W
Peak cathode current	25	A	Frequency	1000	MHz
Anode direct current	6	A			

Typical operation

Frequency	860	MHz	Screen-grid direct current		
Bandwidth	7	MHz	- synchronizing level	50	mA
Anode voltage	5	kVdc	- pedestal level	25	mA
Screen-grid voltage	320	Vdc	Control-grid direct current		
Control-grid voltage	− 80	Vdc	- synchronizing level	500	mA
Anode direct current			- pedestal level	100	mA
- synchronizing level	4. 8	A	Driving power, approx.		
- pedestal level	3. 6	A	- synchronizing level	1000	W
			- pedestal level	600	W
			Load output power, approx. (6)		
			- synchronizing level	12	kW
			- pedestal level	7. 2	kW

(5) Absolute limiting values. No single value ever to be exceeded even under transient conditions. Operation at more than one limiting value at the same time may cause tube damage or destruction. Equipment must be designed so that these limits are never surpassed.

(6) Including power transferred from driver stage and 0. 7 dB loss in output circuits.

CLASS B NARROW-BAND FM SERVICE - RF POWER AMPLIFIER

GROUNDED GRIDS

Maximum ratings (5) (All potentials referred to cathode potential)

Anode voltage	5. 2	kVdc	Anode dissipation	12	kW
Screen-grid (g2) voltage	400	Vdc	Grid g2 dissipation	150	W
Control-grid (g1) voltage	–250	Vdc	Grid g1 dissipation	50	W
Peak cathode current	25	A	Frequency	1000	MHz
Anode direct current	6	A			

Typical operation

Anode voltage	5. 2	kVdc	Anode direct current	4	A
Screen-grid voltage	300	Vdc	Driving power	900	W
Control-grid voltage	–80	Vdc	Anode dissipation, approx.	9	kW
			Load output power (6)	10	kW

INSTRUCTIONS FOR APPLICATION OF VOLTAGES AND TUBE PROTECTION

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.

1 - APPLICATION OF ELECTRODE VOLTAGES

a - $\frac{1}{2}$ V_f (filament voltage) for 60 seconds

b - Nominal V_f for 60 seconds

c - Control-grid (g1) bias voltage

d - Anode voltage

e - Screen-grid (g2) voltage

f - Driving voltage

NOTE : A steady 1. 5 volt filament voltage during standby periods allows the immediate application of this sequence : nominal filament voltage (V_f), control-grid bias voltage, anode voltage, screen-grid voltage, and driving voltage, when it is desired to bring the tube quickly back into service.

2 - PROTECTION AGAINST ANODE, SCREEN-GRID AND CONTROL-GRID OVERCURRENTS

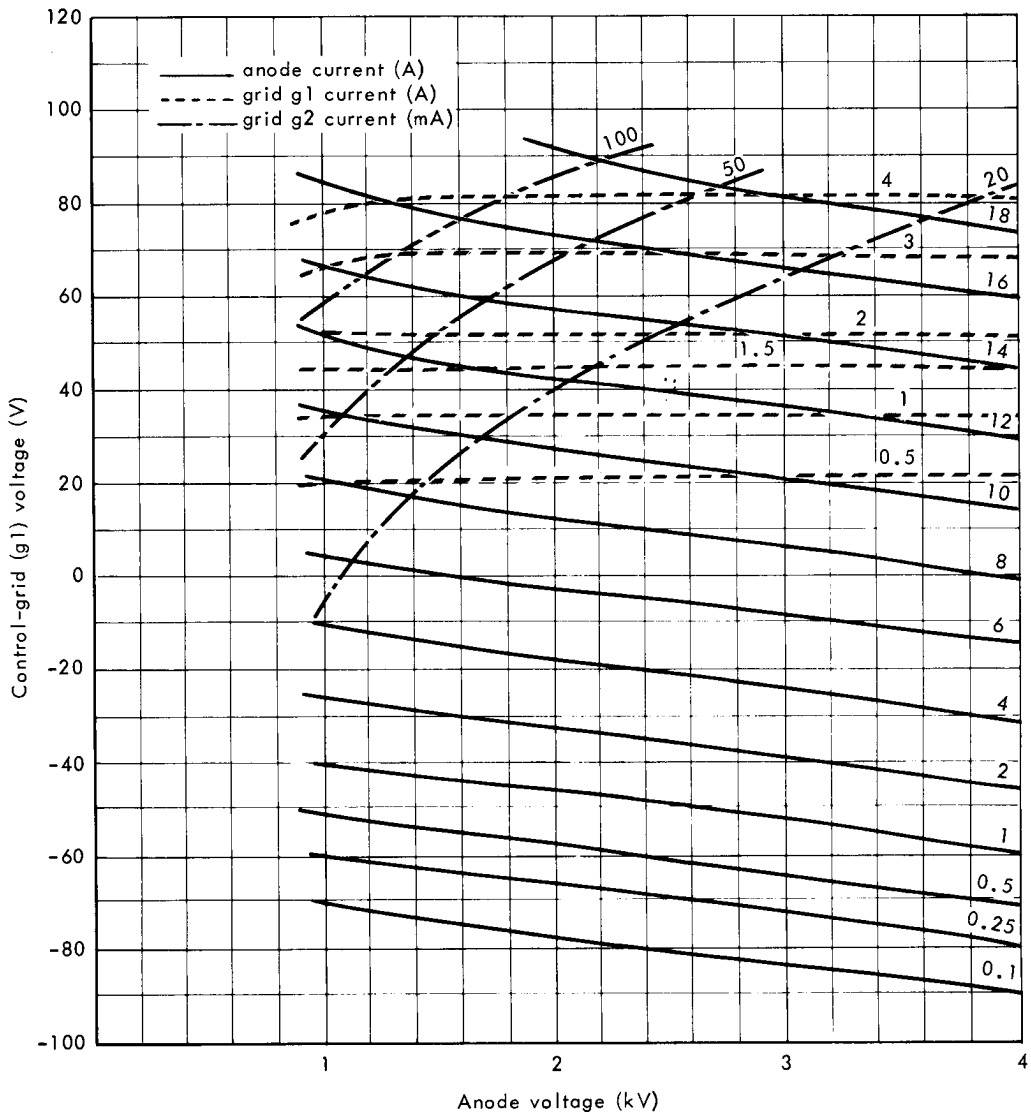
Protection against overcurrents due to incorrect use conditions can be obtained by inserting relays in series with the control-grid, screen-grid and anode, respectively. These relays are to be adjusted to operate when currents equal to 1.5 Imax. are attained, Imax. being the maximum current drawn in normal tube operation. When one of these relays operates, the driving voltage and the screen-grid and anode voltages must be simultaneously cut off.

3 - MONITORING DEVICE FOR OVERTEMPERATURE OF OUTLET COOLING AIR

The temperature of outlet air coming from the anode cavity must not exceed 100 °C. The temperature rises when the cavity is not properly adjusted and it is necessary to provide a monitoring device so as to warn the user of improper adjustment. On the other hand, this device allows the user to be sure that the air evacuation system (generally made by the user) is well suited to the equipment.

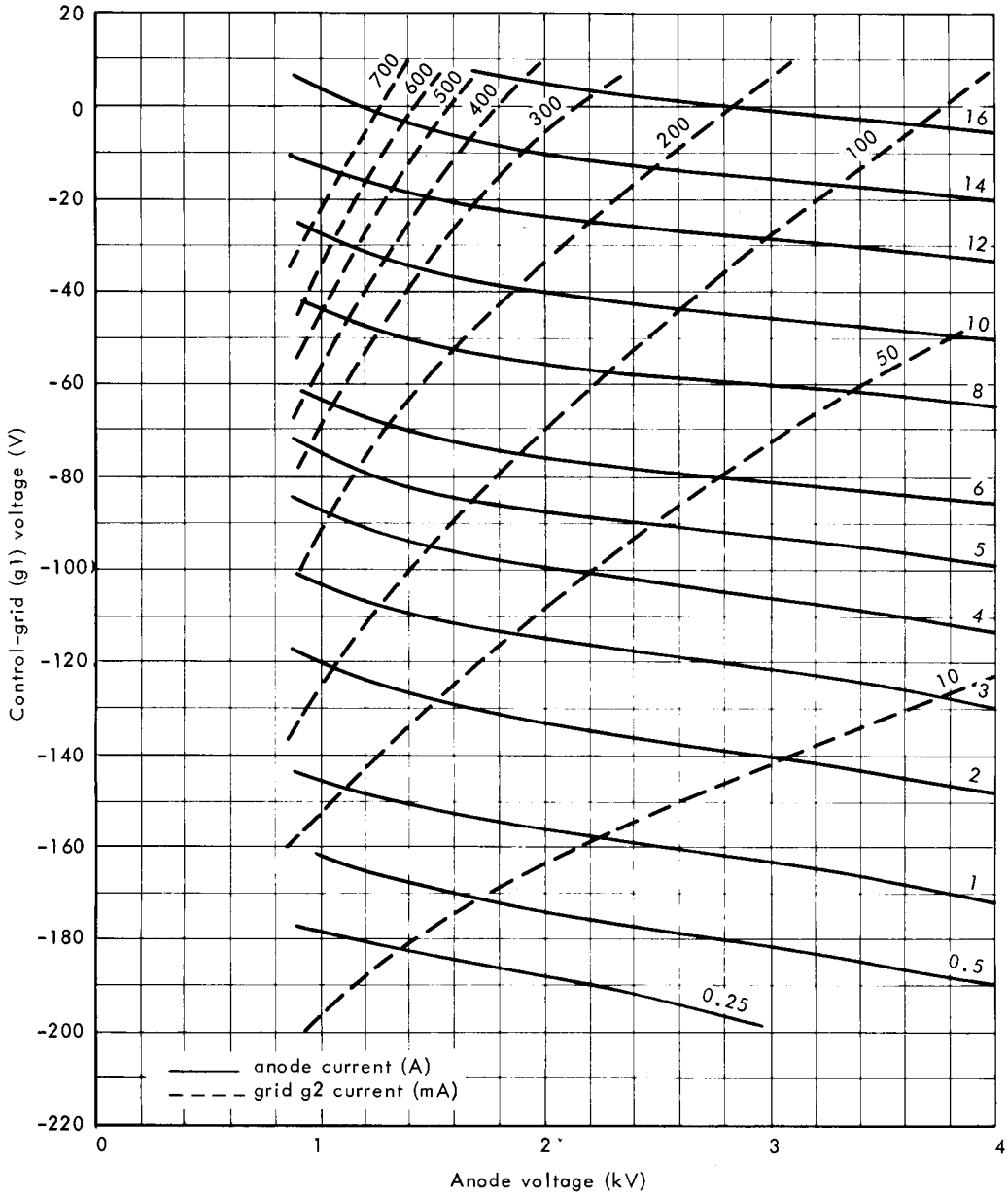
CONSTANT-CURRENT CHARACTERISTICS

Vg2 = 300 V

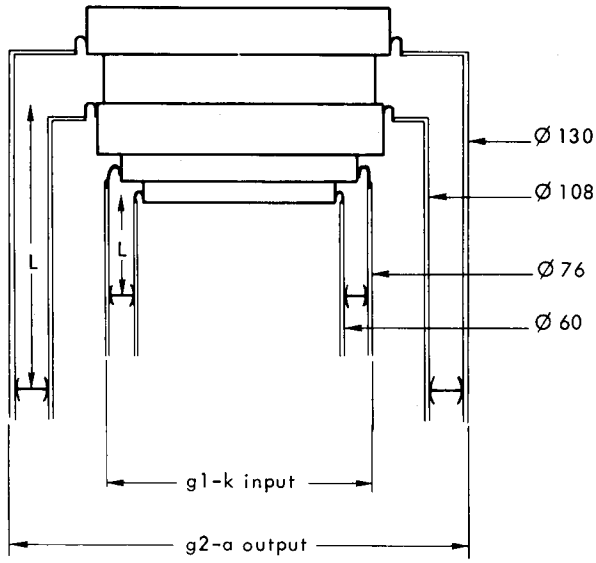


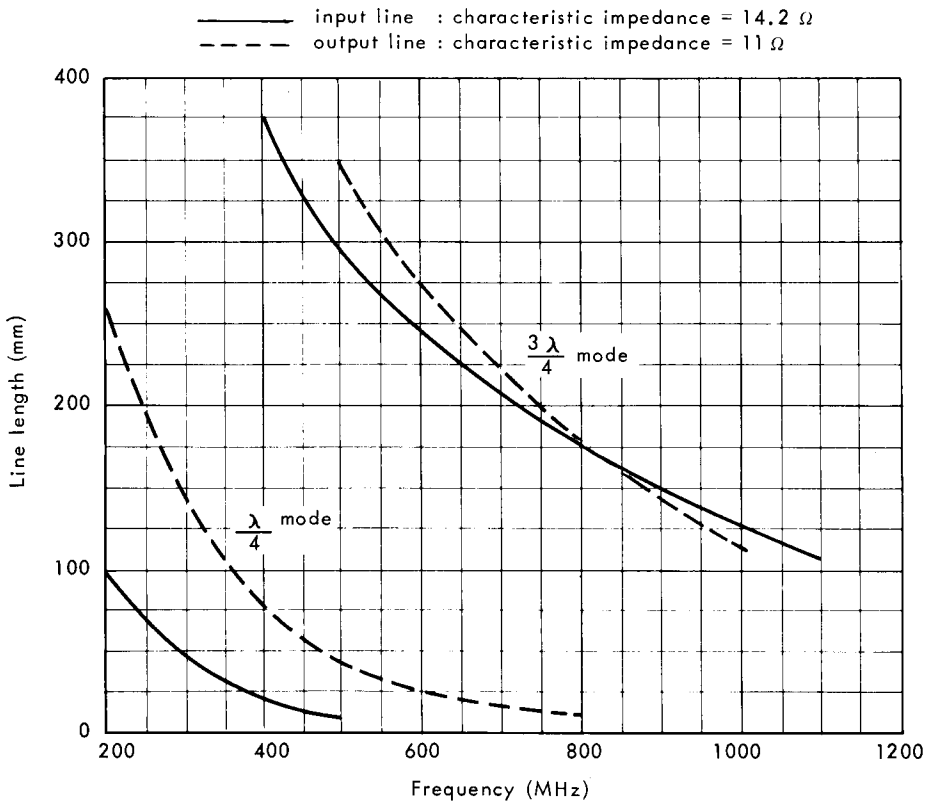
CONSTANT-CURRENT CHARACTERISTICS

Vg2 = 800 V



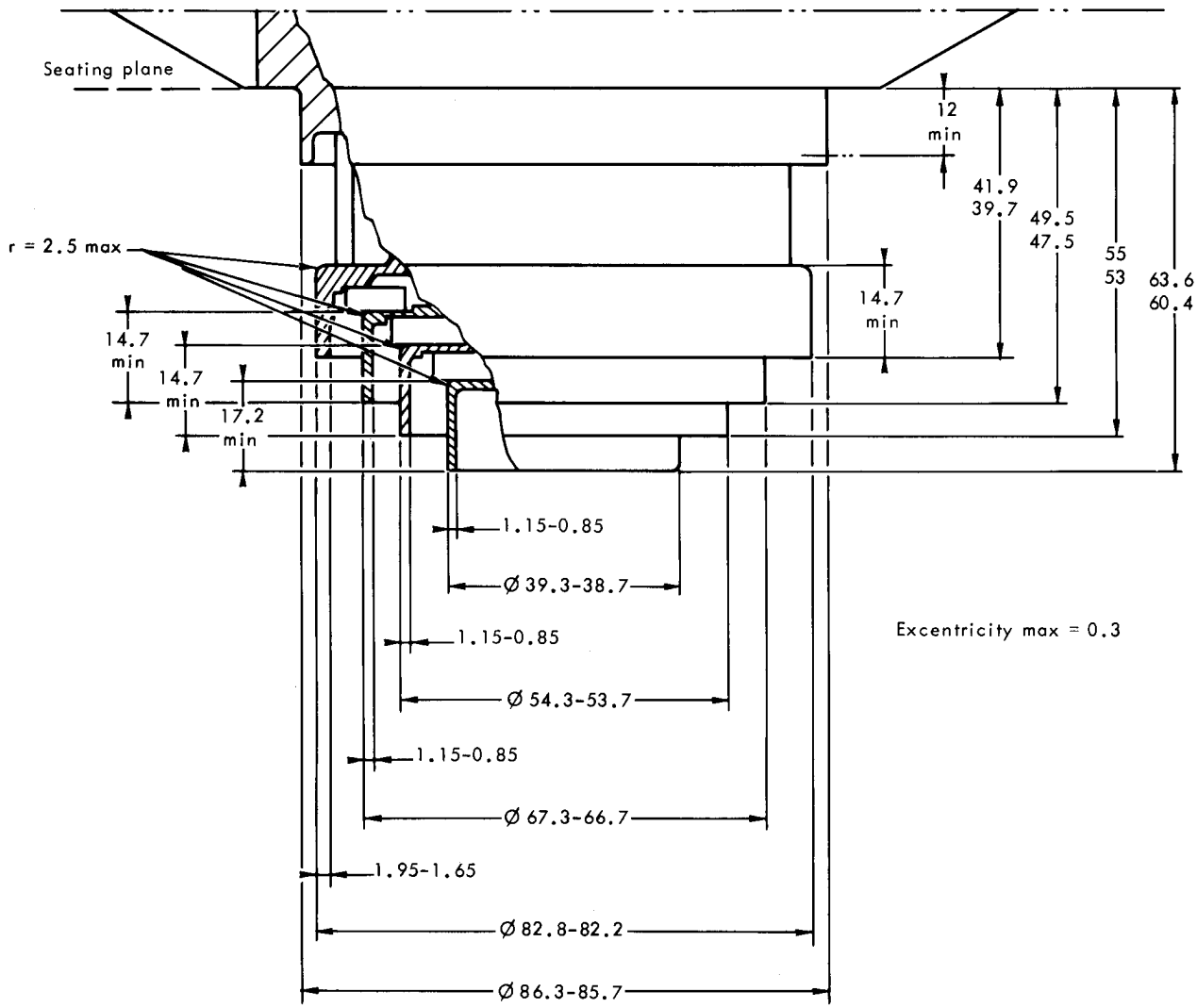
TUNING CURVES





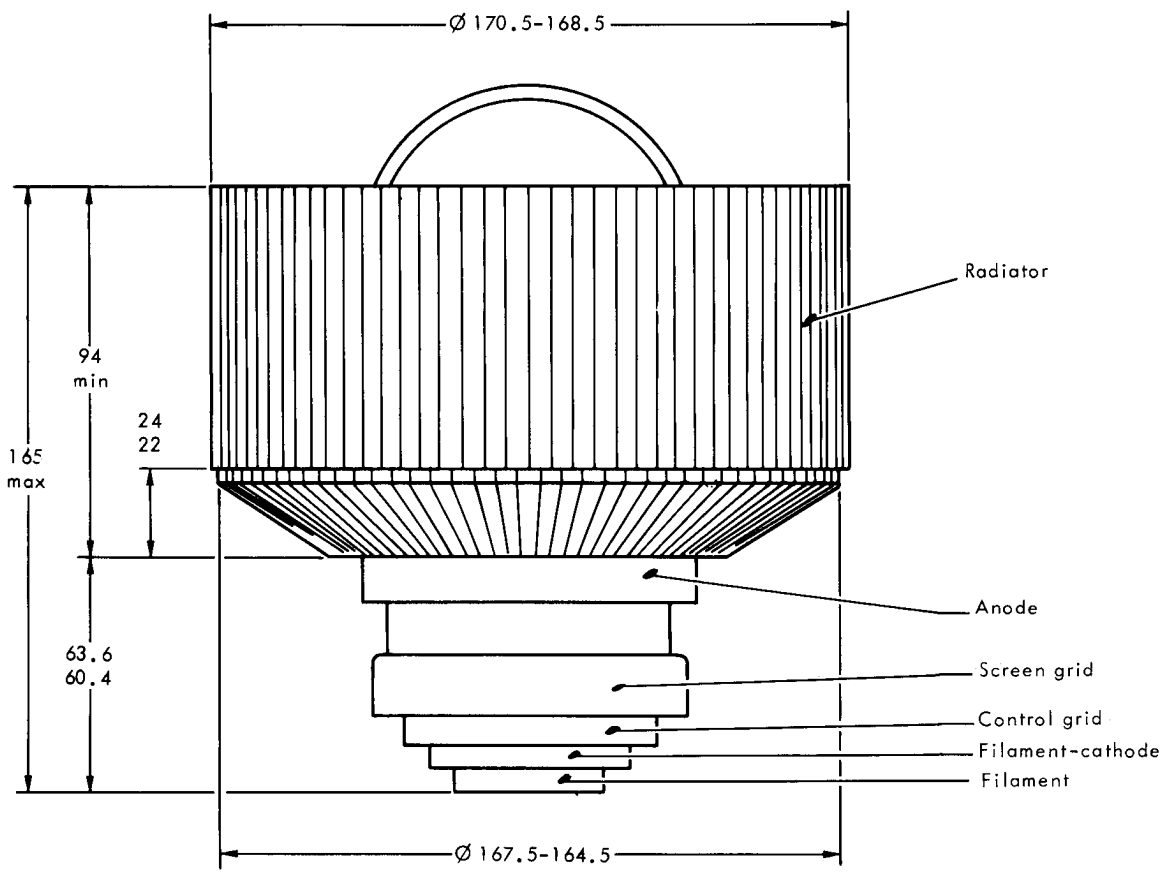
Dimensions in mm.

Details of electrode connections



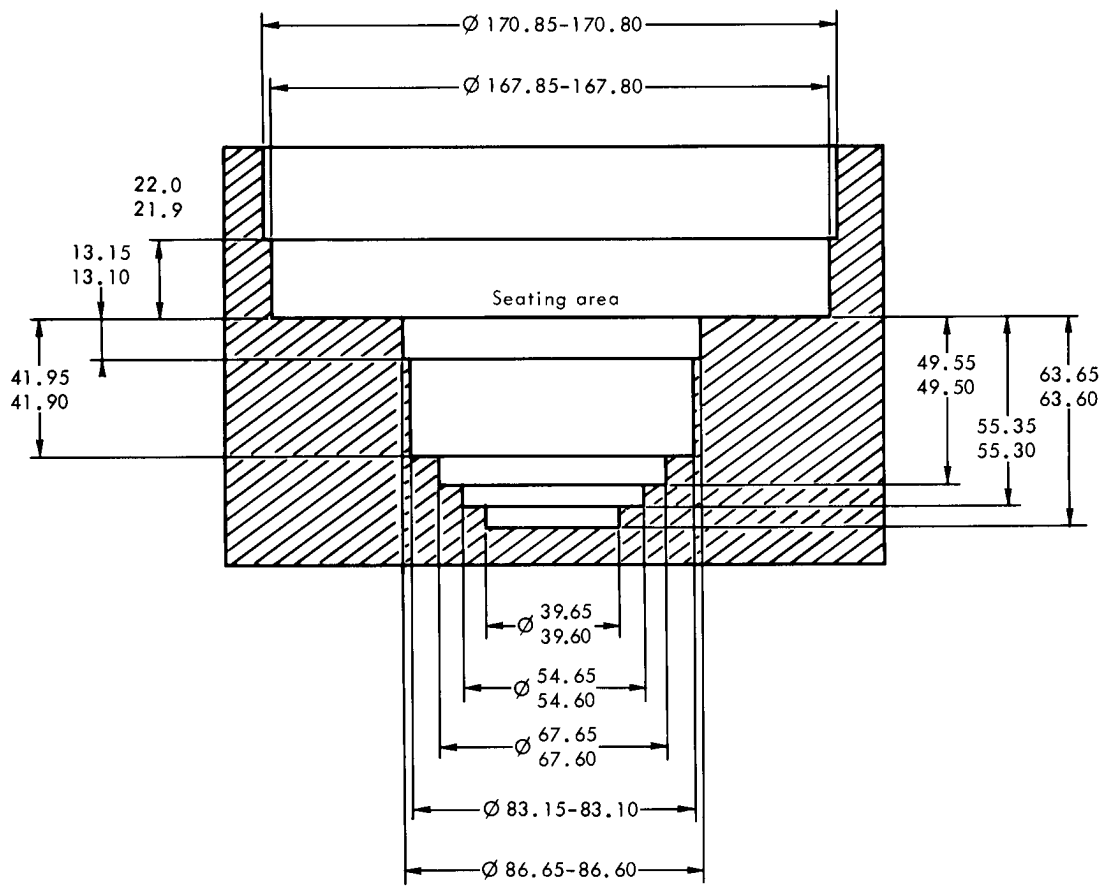
Dimensions in mm, nominal
unless otherwise indicated

OUTLINE DRAWING



Dimensions in mm, nominal
unless otherwise indicated

GAUGE



Dimensions in mm, nominal
unless otherwise indicated

THOMSON-CSF

DIVISION TUBES ELECTRONIQUES