TH 313 TETRODE

The TH 313 is a forced air cooled ceramic metal tetrode, of coaxial structure. It can be used as a C.W. oscillator or a grounded grid R.F. power amplifier at frequencies up to 1000 MHz. The anode can dissipate 7 kW.

TH 313 tetrode is well adapted as a R.F. power amplifier in broadband television transmitter and in S.S.B. or F.M. services.

GENERAL CHARACTERISTICS

Electrical

Type of cathode	thoriated tungsten	
Heating	direct	
Heater voltage (1) (2)	5.0 ± 2 %	V
Heater current, approx.	65	A
Peak cathode current	15	A
Interelectrode capacitance, approx. :		
- input (g2 tied to g1)	43	pF
- output (g2 tied to g1)	9	pF
- cathode-anode	0.07	pF
Amplification factor g1-g2 avg.	5	
Transconductance	50	mA/V

Mechanical

Mounting position	vertical	
Anode cooling	forced air	
Minimum airflow (3)	7	m^3/mn
Corresponding pressure drop	7	millibar
Maximum inlet air temperature	45	°C
Maximum outlet air temperature	100	°C
Maximum temperature (4)	250	°C
Dimensions	see drawing	
Net weight, approx.	3.6	kg

(1) For heater voltage application, see note page 4.

(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 7 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 - R.F. POWER AMPLIFIER

Positive grid modulation and negative synchronization

Grounded grids

MAXIMUM RATINGS

All potentials referred to cathode potential

D.C. anode voltage	5. 2	kV	Anode dissipation	7	kW
D.C. grid g2 voltage	400	V	Grid g2 dissipation	75	W
D.C. grid g1 voltage	- 250	V	Grid g1 dissipation	25	W
Peak cathode current	15	A	Frequency	1000	MHz
D.C. anode current	3. 5	A			

TYPICAL OPERATION

All data given at permanent white level and without synchronization

Frequency	860	MHz	D.C. anode current	2. 3	A
Bandwidth	10	MHz	D.C. grid g2 current	10	mA
D.C. anode voltage	5	kV	D.C. grid g1 current	150	mA
D.C. grid g2 voltage	320	V	Driving power	380	W
R.F. peak driving voltage	140	V	Anode dissipation	5. 2	kW
			Load output power (1)	5. 5	kW

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

CLASS B TELEVISION - R.F. POWER AMPLIFIER

Negative grid modulation and positive synchronization

Grounded grids

MAXIMUM RATINGS

All potentials referred to cathode potential

D.C. anode voltage	5. 2	kV	Anode dissipation	7	kW
D.C. grid g2 voltage	400	V	Grid g2 dissipation	75	W
D.C. grid g1 voltage	- 250	V	Grid g1 dissipation	25	W
Peak cathode current	15	A	Frequency	1000	MHz
D.C. anode current	3. 5	A			

TYPICAL OPERATION

Frequency	860	MHz	D.C. grid g2 current		
Bandwidth	7	MHz	- synchronizing level	20	mA
D.C. anode voltage	5	kV	- pedestal level	5	mA
D.C. grid g2 voltage	320	V	D.C. grid g1 current		
R.F. peak driving voltage			- synchronizing level	250	mA
- synchronizing level	150	V	- pedestal level	60	mA
- pedestal level	110	V	Driving power, approx.		
D.C. anode current			- synchronizing level	420	W
- synchronizing level	2. 5	A	- pedestal level	250	W
- pedestal level	1. 9	A	Load output power, approx. (1)		
			- synchronizing level	6	kW
			- pedestal level	3. 6	kW

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

CLASS B NARROW BAND F.M. SERVICE - R.F. POWER AMPLIFIER

Grounded grids

MAXIMUM RATINGS

All potentials referred to cathode potential

D.C. anode voltage	5. 2	kV	Anode dissipation	7	kW
D.C. grid g2 voltage	400	V	Grid g2 dissipation	75	W
D.C. grid g1 voltage	– 250	V	Grid g1 dissipation	25	W
Peak cathode current	15	A	Frequency	1000	MHz
D.C. anode current	3. 5	A			

TYPICAL OPERATION

D.C. anode voltage	5. 2	kV	D.C. anode current	2. 2	A
D.C. grid g2 voltage	300	V	Driving power	360	W
Peak R.F. driving voltage	160	V	Anode dissipation	5. 5	kW
			Load output power (1)	6	kW

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

LINEAR AMPLIFIER

SINGLE SIDE BAND SUPPRESSED - CARRIER SERVICE

TWO TONE MODULATION

MAXIMUM RATINGS

All potentials referred to cathode potential

D.C. anode voltage	6. 0	kV	Anode dissipation	7	kW
D.C. grid g2 voltage	800	V	Grid g2 dissipation	75	W
D.C. grid g1 voltage	– 250	V	Frequency	1000	MHz
Average anode current at peak of envelope	3. 5	A			

TYPICAL OPERATION

Class AB_1 - Two tone modulation

D.C. anode voltage	5. 7	kV	Average grid g2 current at peak of envelope	70	mA
D.C. grid g2 voltage	700	V	Average grid g2 current	50	mA
Zero signal anode current	0. 7	A	Load impedance	1100	Ω
Average anode current at peak of envelope	2. 7	A	Circuit efficiency	90	%
Average anode current	1. 9	A	Average load power	3. 5	kW
			Load peak envelope power	7	kW

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 - Nominal Vf during 120 seconds provided that the filament current If should be limited to 3 times the nominal value when Vf is switched on.

2- Grid bias

3- Anode voltage

4- Screen voltage

5- 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.

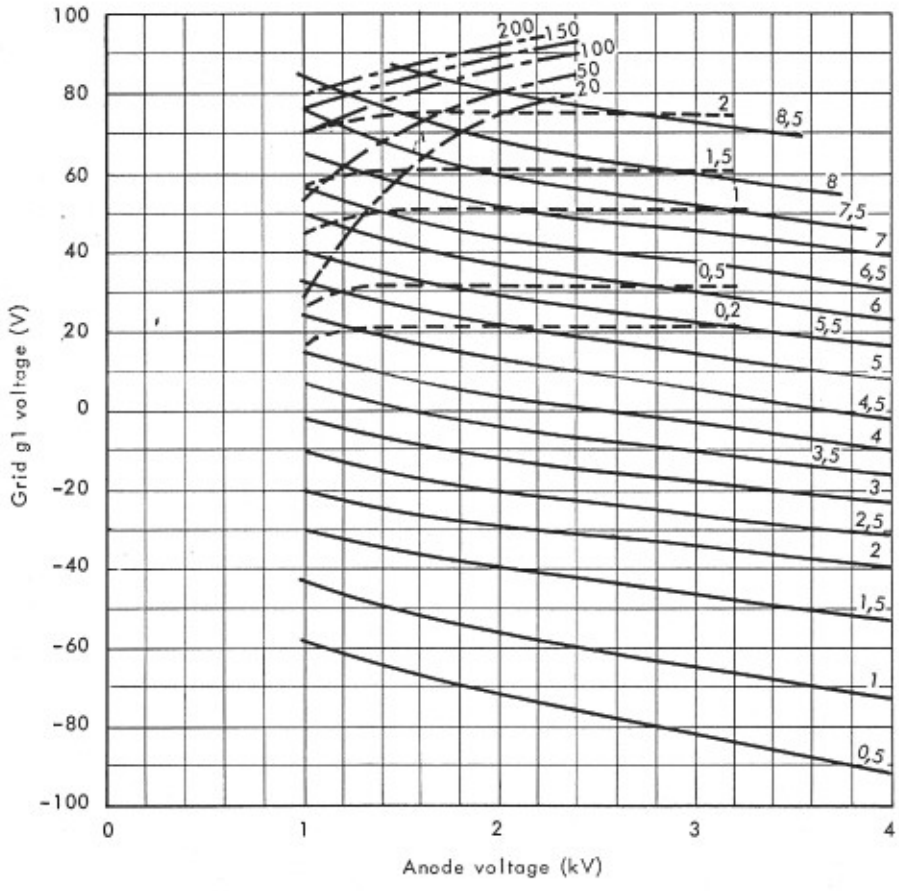
III – MONITORING DEVICE FOR OVERTEMPERATURE OF OUTLET COOLING AIR :

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

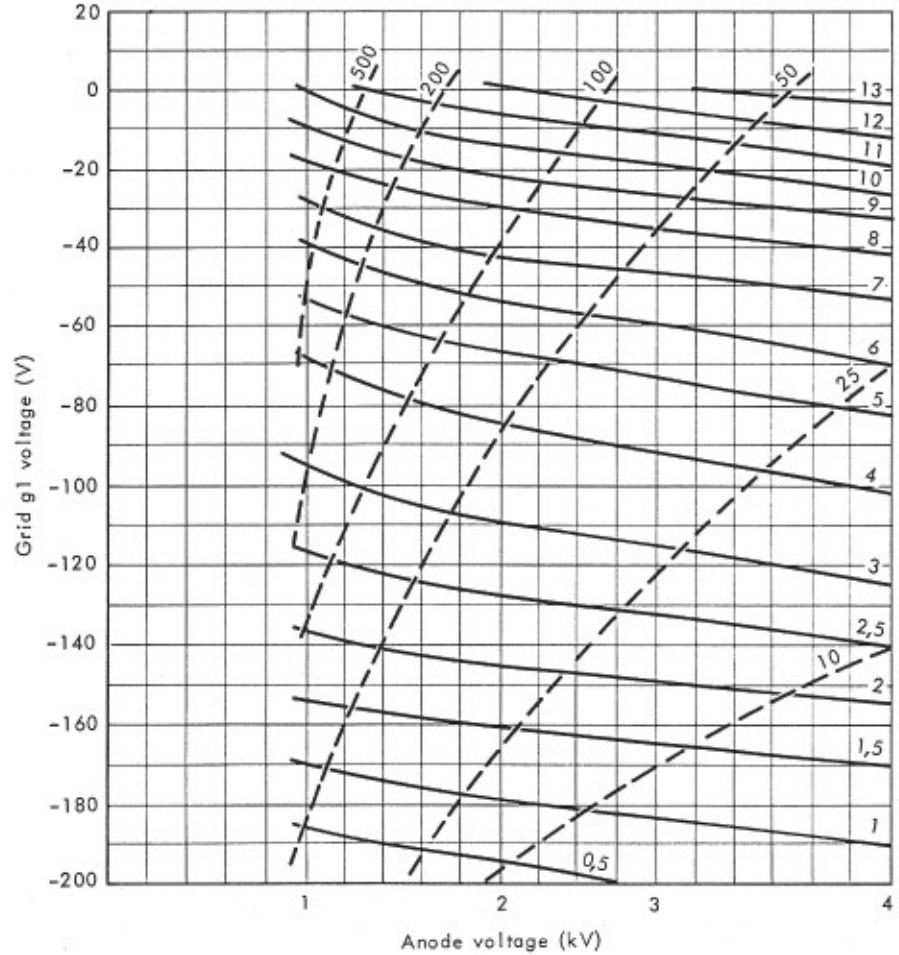
Vg2 = 300 V

——— Anode current (A)
- - - - - Grid g1 current (A)
— — — Grid g2 current (mA)

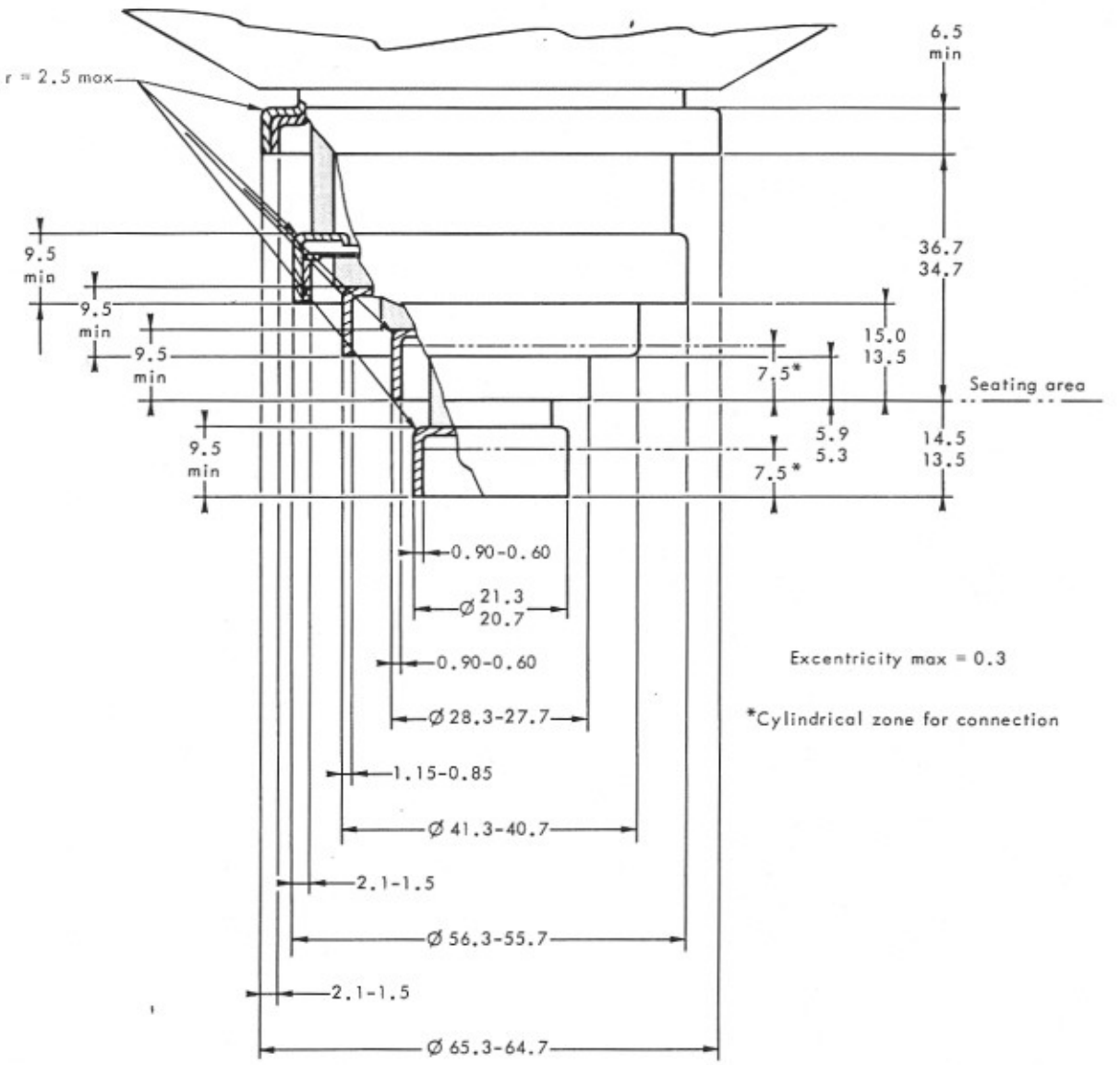


Vg2 = 800 V

——— Anode current (A)
— — — Grid g2 current (mA)

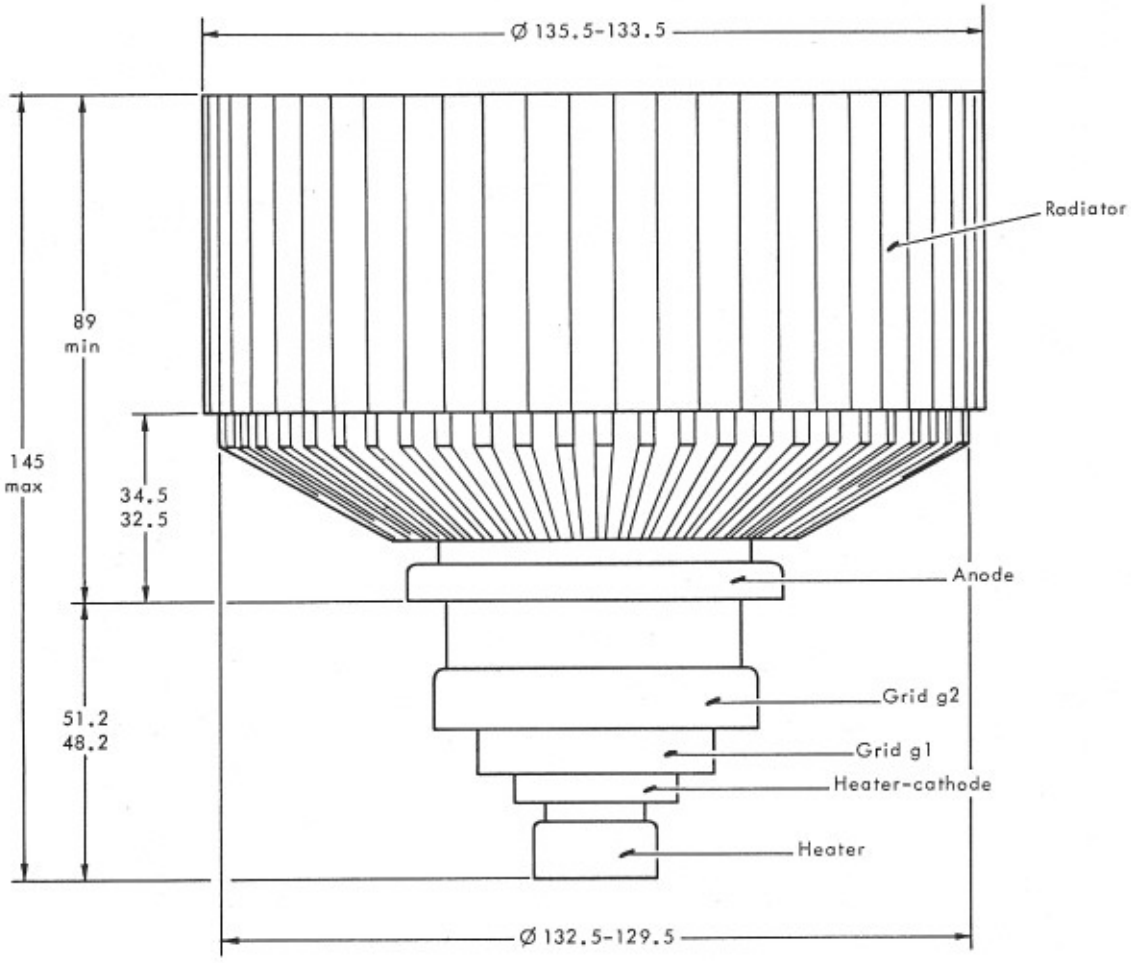


Details of electrode terminals



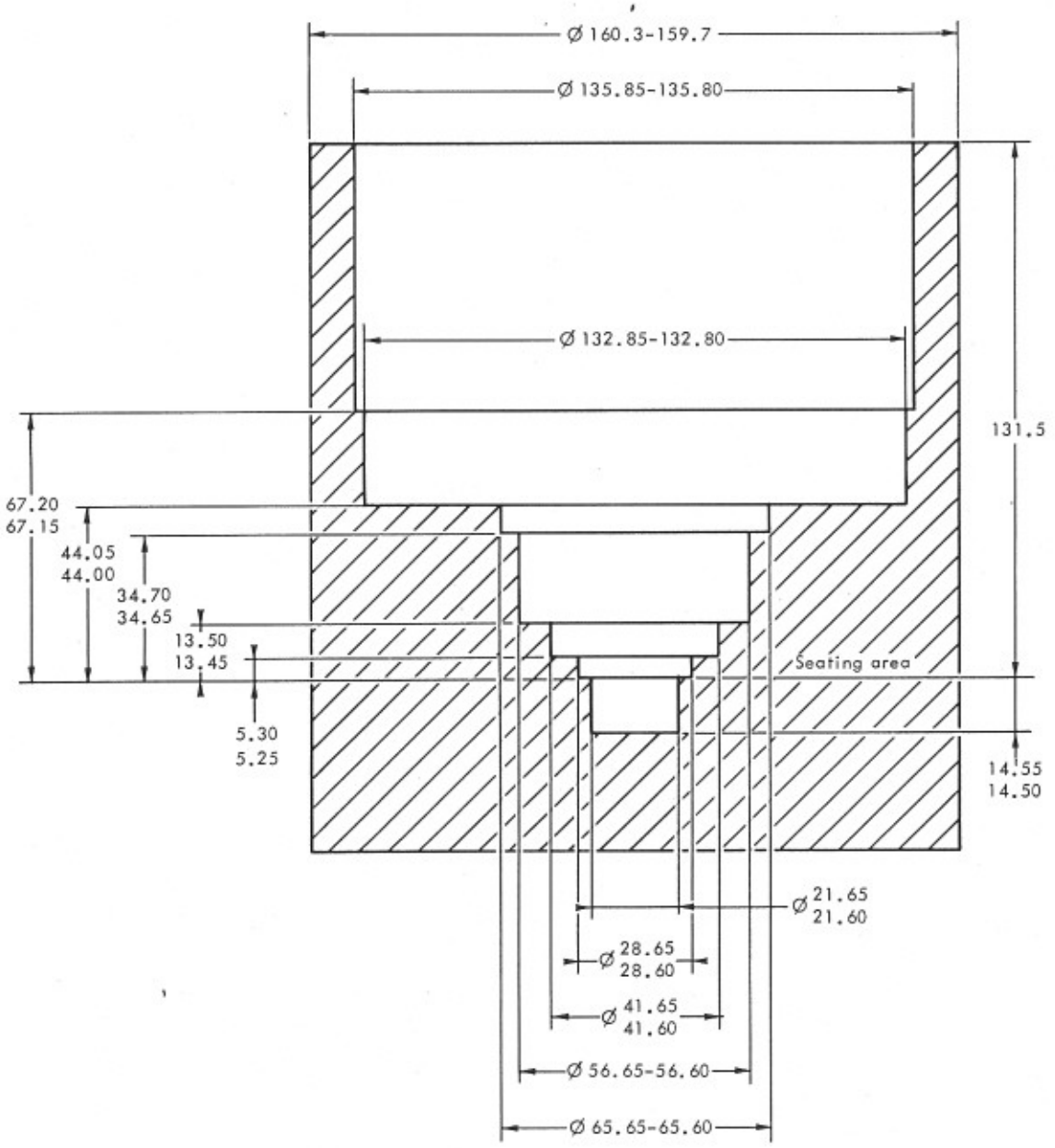
Dimensions in mm.

OUTLINE DRAWING



Dimensions in mm.

GAUGE



Dimensions in mm.