PRASAR BHARATI
BROADCASTING CORPORATION OF INDIA
DIRECTORATE GENERAL: ALL INDIA RADIO
(PLANNING & DEVELOPMENT UNIT)

Specifications No.: Specs./18/1/2007/TM/1013

Specifications of Ceramic Tetrode Valve Type: CQK- 25-2/ BEL- 40,000 CX

1. Scope:

This Ceramic Tetrode Valve is being used in Class-B modulator stage of 100 KW MW HMB-140 BEL , 50/100 KW SW BBC/BEL make Transmitters and in PA stage of 50 KW SW BBC/BEL make Transmitters in AIR Network.

2. General Characteristic of the valve:

The valves offered should be **New and of first quality**.

a.	Valve:	Ceramic metal Tetrode with co-axial structure.
b.	Filament:	Thoriated tungsten cathode with direct heating.
c.	Anode:	Condensed water vapour cooled.
d.	Operating frequency:	Upto 30 MHz.
e.	Operating position:	Vertical, Anode up.
f.	Weight:	Approx.32kg.

3. Eligibility of the supplier:

a. The supplier must posses valid ISO 9001/ 2000 Certificate in production.
b. Original Equipment Manufacturer or their Authorised agent shall only be eligible to quote.
c. Authorisation letter must be ink signed by the OEM and submitted along with the tender. Name and address of the OEM and location of its manufacturing facilities is to be given.
d. The supplier must possess an experience of at least 2years in manufacturing.
e. The supplier must provide past record of timely and good quality supply of tendered items to Broadcast Organisations in the preceding two years supported with copies of orders placed by the Broadcast Organisation with the Manufacturing firm, and Broadcaster's satisfaction letters regarding the tendered item.

Any offer which fails to meet the above eligible condition will be summarily rejected.

4. Electrical Specifications:

4.1.1	Filament voltage:	10	V(AC) ±5%
	Filament current:	210	A
	Max starting current:	1800	A
	Cold Resistance:	0.005	Ω
	Mutual Conductance	65	m A/V

4.1.2 Interelectrode Capacitance:

	Typical	Unit
$K - G_1$	135	pf.
$K - G_2$	11	pf.
$K - A$	0.35	pf.
$G_1 - G_2$	170	pf.
$G_1 - A$	3.0	pf.
$G_2 - A$	55	pf.

4.1.3 Amplification Factor: $\mu g_2 g_1$ **6.5**

5. Mechanical Specifications:

Max. Length- **338 mm**
Max diameter- **160 mm**
Weight with packing- **32 Kg**
Weight without packing-**11.6 Kg**

(Please also see the attached diagram of the valve)

6. Operating Data:

6.1 Maximum Rating:

DC Anode voltage	12	KV
DC Screen grid voltage	1.5	KV
Screen Grid dissipation	750	W
Anode dissipation	40	KW
Control Grid Dissipation	400	W
Dc Control Grid Voltage	- 600	V
Peak Cathode Current	80	A
Frequency	200	MHz

6.2 Class B, AF Power Amplifier and Modulator:

Maximum Rating:

DC Anode voltage	12	KV
DC Screen grid voltage	1.5	KV
Signal DC anode current	10	A
Power input	80	kW
Screen Grid dissipation	750	W
Anode dissipation	40	KW

Typical Operation Ratings for Two Tubes in Push- Pull:

DC Anode voltage	12	10	KV
DC Screen grid voltage	1500	1500	V
DC control grid voltage	-280	-270	V
Peak AC control grid voltage(G-G)	530	520	V
Signal DC anode current Max	17	18	A
Zero Signal DC anode current	2.0	2.0	A
DC screen grid current	0.75	0.8	A
DC control grid current	0	0	
Driving Power	0	0	
Output power	140	120	KW
Load resistance Anode-to-anode	3150	2410	Ω

6.3 Class- C, HF Power Amplifier without modulation:

Maximum Rating:

DC Anode voltage up to 30MHz	10	KV
DC Screen grid voltage	1200	V
DC Control grid voltage	-600	V
DC Control grid current	1	A
DC Anode current	10	A
Screen Grid dissipation up to 30MHz	750	W
Power input	100	KW
Anode dissipation	40	KW
Control grid dissipation	400	W
Grid resistor (Tube not conductive)	10	KΩ

Typical Operation Ratings:

DC Anode voltage	12	10	KV
DC Screen grid voltage	1200	1200	V
DC control grid voltage	-520	-510	V
Peak AC control grid voltage	605	595	V
DC Anode current	8.3	8.2	A
DC screen grid current	0.5	0.5	A
DC control grid current	0.3	0.3	A
Driving Power	170	170	W
Output power	79	64	KW
Power output at f ≤ 3MHz	80	65	KW
Frequency Maximum	30	30	MHz

Class C, Anode - Screen Modulated, RF Power Amplifier:

Maximum Rating:

DC Anode voltage up to 30MHz	10	KV
DC Screen grid voltage	800	V
AC Screen grid voltage	700	V (Modulation factor 1)
DC Control grid voltage	-600	V
DC Control grid current	1	A
DC Anode current	8.5	A
Screen Grid dissipation	500	W
Anode dissipation	27	KW
Power input	85	KW
Control grid dissipation	400	W
Grid resistor (Tube not conductive)	10	KΩ

Typical Operation Ratings: (Modulation factor 1)

DC Anode voltage	10	8	KV
DC Screen grid voltage	800	800	V
Peak AC screen grid voltage	700	700	V
DC control grid voltage	-400	-405	V
Peak AC control grid voltage	500	520	V
DC anode current	6.8	6.8	A
DC screen grid current	0.5	0.7	A
DC control grid current	0.4	0.54	A
Driving Power	200	270	KW
Output power	54	43	KW
Power output at f ≤ 3MHz	55	44	KW
Frequency maximum	30	30	MHz

6.4 **Class- C, HF Power Amplifier without modulation:**

Maximum Rating:

DC Anode voltage up to 30MHz	10	KV
DC Screen grid voltage	1200	V
DC Control grid voltage	-600	V
DC Control grid current	1	A
DC Anode current	10	A
Screen Grid dissipation up to 30MHz	750	W
Power input	100	KW
Anode dissipation	40	KW
Control grid dissipation	400	W
Grid resistor (Tube not conductive)	10	KΩ

Typical Operation Ratings:

DC Anode voltage	12	10	KV
DC Screen grid voltage	1200	1200	V
DC control grid voltage	-520	-510	V
Peak AC control grid voltage	605	595	V
DC Anode current	8.3	8.2	A
DC screen grid current	0.5	0.5	A
DC control grid current	0.3	0.3	A
Driving Power	170W	170	W
Output power	79	64	KW
Power output at f ≤ 3MHz	80	65	KW
Frequency Maximum	30	30	MHz

6.5 Tube Cooling:

Anode of the valve should be condensed water vapor cooled.

Minimum water flow		10 l/min
At Pa > 20 KW → water flow		0.5 l/min kW
Water flow on filament header	min.	0.6 m^3/min
Water flow on anode cooling ring	min.	0.3 m^3/min
Minimum air flow at the base of the tube		3 m^3/min
Temperature of Ceramic Cylinder & of metal ceramic seals	max.	220 °C

7. Certificate of Origin:

i. In order to verify that each tube supplied by OEM comes from an ISO-9001/2000 certified factory, the vendor should provide country of origin and type of the tube, and Sr. No., if any, must be engraved or inked on the body of each tube and it must be visible easily even while in operation.

b) In the absence of such a certificate of origin on the tubes, the tubes shall be considered as rebuilt or not manufactured by vendor.

c) Rebuilt/ Refurbished/Reconditioned tube shell not be accepted

8. Package and Marking

Please refer to the relevant clause in the booklet "Instructions **to Bidders**"

9. INSURANCE AGAINST WAR AND MARINE RISK:

Please refer to Commercial terms for transportation by air, sea and land up to ultimate consignee.

10. Tube Appearance

The tube (Valve) brazing area, ceramic cleanliness, electrical connections, coolant connection, plating, shining silver plated surface around anode, cathode grid rings should be of high quality.

The shining of silver plated on cathode, grid and anode ring should be as good as new after the run of 500 hours operation of the tube.

11. Delivery

Delivery should complete in nine months after the issue of the AT.

12. Guarantee Conditions

The electron tubes shall be free from defects in design, material and workmanship. The tube will be operated within pre designed fixed parameters and dynamic broadcast parameters, by taking all cooling conditions into account.

The tube shall be guaranteed for 5000Hrs. of heater/filament operation or 2 years from the date of receipt which ever occur first. In case of failure of the tube within the first 500 Hrs. full free replacement with a **New and of first quality tube** is to be provided by the OEM/ supplier. Prorata credit will be for failure of tube between 500hrs. and 5000hrs. The claim shall be settled by the **Supplier/OEM without any option** as given below :

If the tube fails after 500 hours and within guaranteed 5000 hours, then prorata

$$C = \frac{P(G-H)}{G}$$

C - Credit
G - Guaranteed no. of hours
H - Useful filament hours served by the defective tube.
P - Purchased price of defective tube.

13. Performance Guarantee

As per DGS and D rule

14. Literature

Necessary literature, catalogues concerning to the article in supply and the company profile including the manufacturing procedure etc. must be supplied by the Bidder.

Diagram