e2v technologies

BW1643J2
RF Power Triode

The data should be read in conjunction with the Power Triode Preamble.

ABRIDGED DATA

The BW1643J2 is a water-cooled power triode of coaxial ceramic/metal construction, intended primarily for industrial service. It has an integral water jacket.

Anode dissipation	240	kW max
Anode voltage	18	kV max
Frequency for full ratings	30	MHz max
Output power (class C oscillator, less drive)	530	kW

GENERAL

Electrical

Filament	thoriated tungsten	
Filament voltage (see note 1)	14	V
Filament current	555	A
Filament cold resistance	3.0	mΩ
Peak usable cathode current	250	A max
Amplification factor (V_a = 16 kV, I_a = 18 A)	35	
Inter-electrode capacitances:		
grid to anode	70	pF
grid to filament	225	pF
anode to filament	3.9	pF

Mechanical

Overall length	625	mm max
Overall diameter	231	mm max
Net weight	30	kg approx
Mounting position (see note 2)	vertical, anode up or down	

Accessories

Filament connector (without lead)†	MA291C
Cathode connector (without lead)†	MA291D
Grid connector:	
above 2 MHz	MA342
below 2 MHz	MA464
Thermal fuse	MA85E or MA85G
Water coupling, 2 supplied with BW1643J2	MA2685A
Filament connector (with lead)†	MA2664B
Cathode connector (with lead)†	MA2664A
Filament lead only	MA2663A
Cathode lead only	MA2663B

† The tightening torque applied to the clamping screw must be between the limits of 2.26 Nm min and 3.96 Nm max.

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COOLING

Anode

The BW1643J2 has an integral water jacket; the water cooling requirements are given in the following table.

Anode plus grid dissipation (kW)	Inlet temperature (°C)	Minimum water flow rate (l./min)	(US gal/min)	Pressure drop (bar)	Outlet temperature (°C)
240	20	120	31.7	1.0	50
240	50	180	47.6	1.8	70
200	20	95	25.1	0.648	52
200	50	144	38.0	1.2	71
160	20	72	19.0	0.42	54
160	50	110	29.1	0.751	72
110	20	47	12.4	0.227	56
110	50	73	19.3	0.441	73

The inlet water temperature must not exceed 50 °C.

The pressure in the water jacket must not exceed 6.8 bar.

Seals and Envelope

The temperature of the seals and envelope must not exceed 220 °C. Cooling of the seals by low velocity air flow is required.

RADIO FREQUENCY OSCILLATOR FOR INDUSTRIAL SERVICE

(Class C conditions, one tube)

MAXIMUM RATINGS (Absolute values)

Frequency for full ratings	30	MHz
Anode voltage	18	kV
Anode input power (see note 3)	750	kW
Anode dissipation	240	kW
Grid voltage	−2.5	kV
Grid current:		
on load	9	A
off load	11	A
Grid dissipation	6.0	kW
Grid circuit resistance	10	kΩ
Cathode current (peak)	250	A
Cathode current (mean)	55	A

TYPICAL OPERATING CONDITIONS

Frequency	30	30	30	MHz
Anode voltage	12	14	16	kV
Anode current	39.1	41	43.5	A
Anode dissipation	107.3	123.5	151.7	kW
Grid voltage	−550	−650	−750	V
Grid resistor	69	83	107	Ω
Grid current	8.0	7.8	7.0	A
Grid dissipation	4.3	4.3	3.8	kW
Feedback ratio (see note 4)	9.8	9.3	8.9	%
Oscillator output power (see note 5)	353.8	440.7	535.6	kW
Efficiency	75.3	76.8	76.9	%

NOTES

1. Temporary fluctuations up to +5% or −10% in filament voltage are permissible.
2. The water inlet and outlet connectors are numbered for identification. See outline for direction of water flow depending on mounting position.
3. A fast-acting overcurrent cutout, acting on the anode supply, is essential for protecting the tube in the event of an internal flashover. One or both of the following tests on the anode power supply may be used to check that the overcurrent cutout is fast enough. In both tests the applied anode voltage is short-circuited by means of a high voltage switch directly at the tube anode.

   Test 1 In this test the short-circuit current flows through a length of copper wire (approximately 2 to 3 cm/kV of applied anode voltage). A copper wire of 0.3 mm diameter should not fuse.

   Test 2 In this test the short-circuit current flows through a current transformer or a meter shunt of low resistance and is measured with an oscilloscope.

   The integral $\int I^2 dt$ over the time that the current is flowing should not exceed 500 A^2sec.

4. The feedback ratio is defined as $\frac{V_{g(pk)}}{V_{a(pk)}} \times 100$

   where $V_{g(pk)}$ = peak RF grid voltage in volts

   and $V_{a(pk)}$ = peak RF anode voltage in volts.

5. Oscillator output power = $P_{out} - P_{drive}$

   where P_{out} = output power of tube to anode circuit

   and P_{drive} = drive power fed back to grid circuit.

HEALTH AND SAFETY HAZARDS

e2v technologies electronic devices are safe to handle and operate, provided that the precautions stated are observed. e2v technologies does not accept responsibility for damage or injury resulting from the use of electronic devices it produces. Equipment manufacturers and users must ensure that adequate precautions are taken. Appropriate warning labels and notices must be provided on equipments incorporating e2v technologies devices and in operating manuals.

High Voltage

Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and other stored energy before allowing access. Interlock switches must not be bypassed to allow operation with access doors open.

RF Radiation

Personnel must not be exposed to excessive RF radiation. A properly designed equipment cabinet with good RF electrical connection between panels will normally provide sufficient protection.

X-Ray Radiation

This device, when operating at voltages above 5 kV, produces progressively more dangerous X-rays as the voltage is increased; the radiation varies greatly during life. The device envelope provides only limited protection and further shielding may be required. A metal equipment cabinet with overlapping joints will usually provide sufficient shielding, but if there is any doubt an expert in this field should perform an X-ray survey of the equipment.

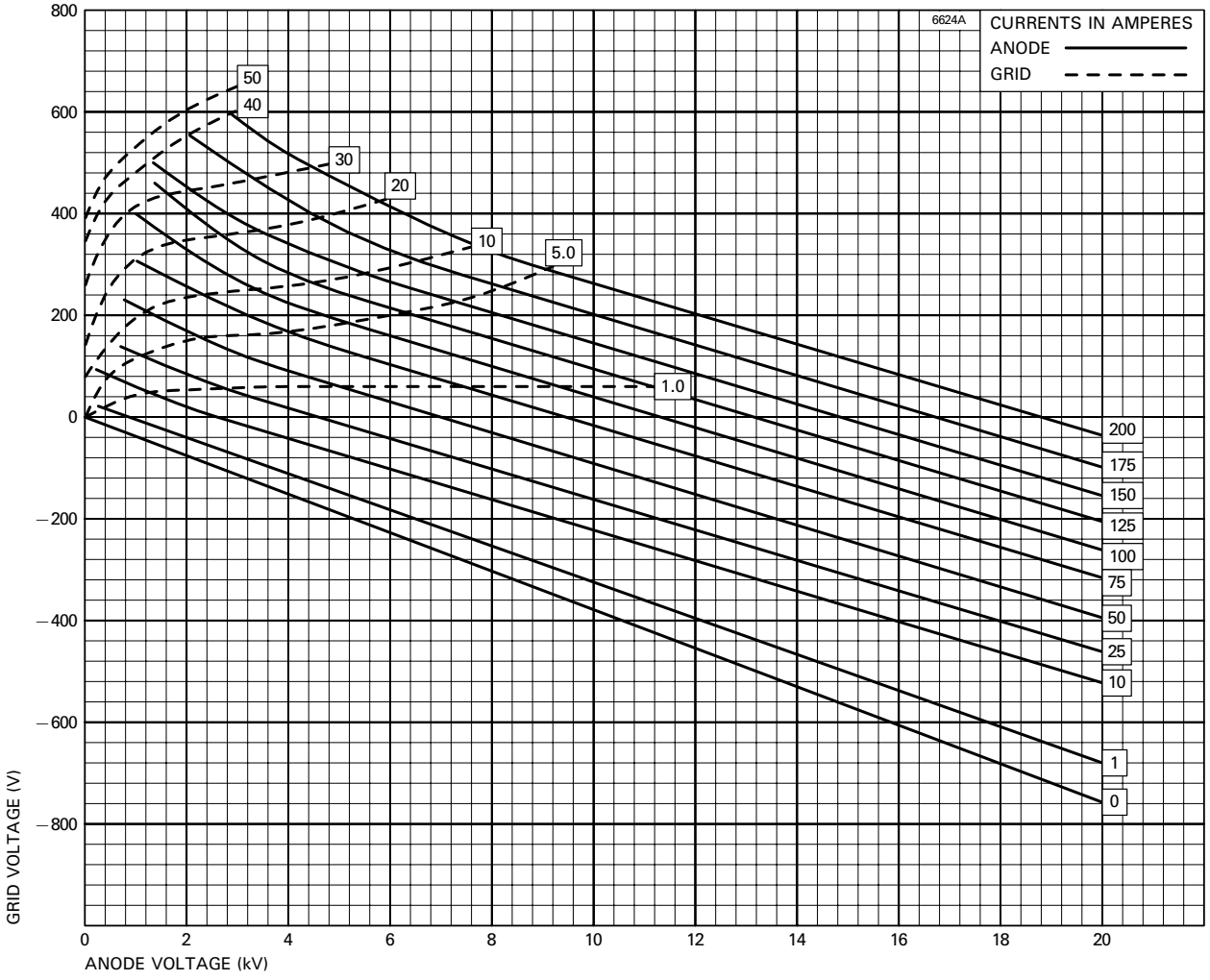
Implosion

This tube stores potential energy by virtue of its vacuum. The energy level is low, but there is some hazard from flying fragments if the tube is dropped or subjected to violent impact. The tube must be stored and transported in its approved pack. During installation or replacement the tube must not be scratched or damaged in any way likely to reduce the strength of the ceramic envelope.

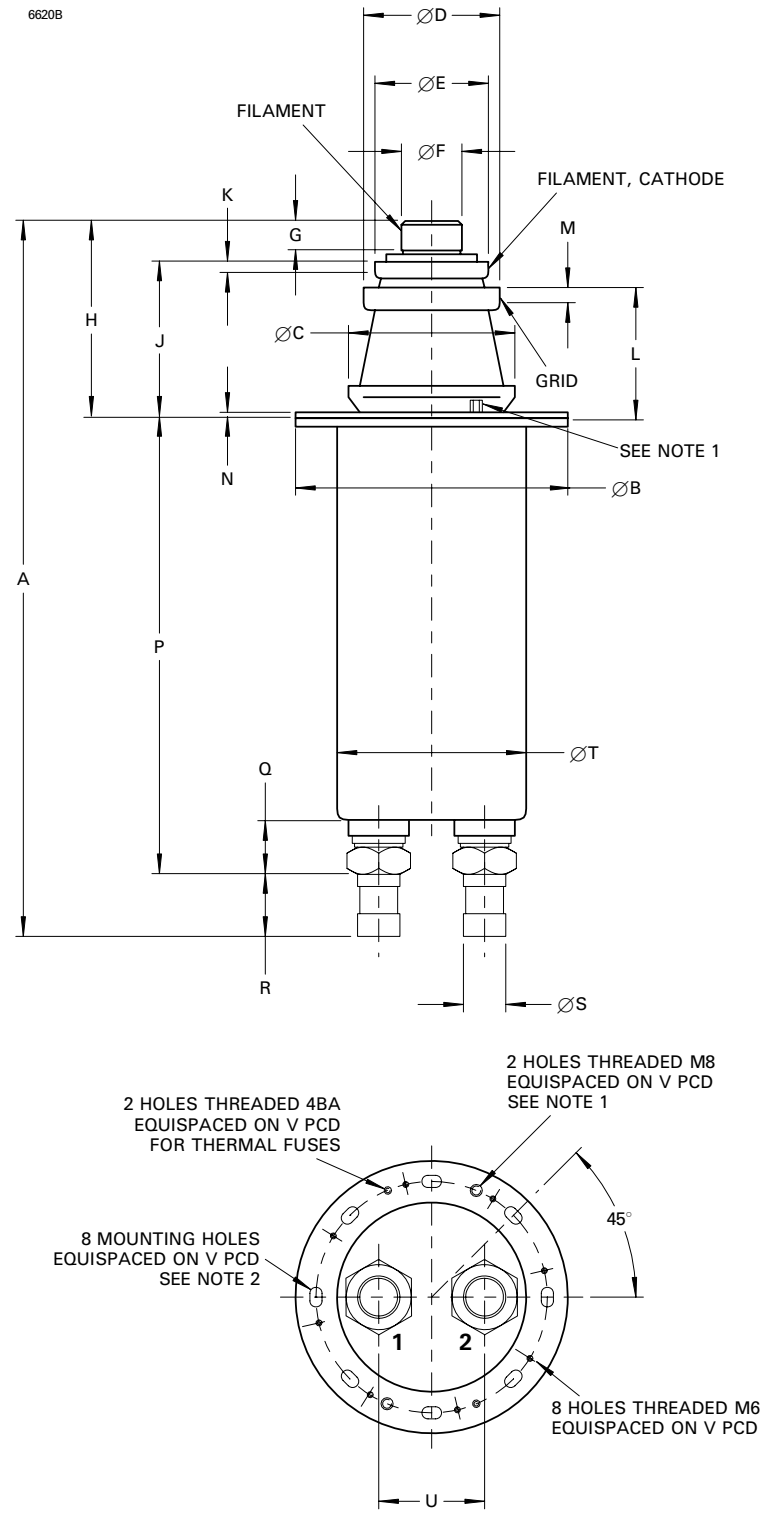
References

1. BS 3192. Specification for safety requirements for radio (including television) transmitting apparatus.
2. TEPAC Publication no. 181. Recommended practice for measurement of X-radiation from power tubes.

TYPICAL CONSTANT CURRENT CHARACTERISTICS



OUTLINE (All dimensions without limits are nominal)



Ref	Millimetres
A	625.0 max
B	231.0 max
C	146.0 max
D	112.0 ± 0.3
E	96.0 ± 0.3
F	54.0 ± 0.2
G	25.0
H	175.0 max
J	137.0
K	15.0
L	113.0
M	14.0
N	6.0
P	394.0
Q	47.0
R	56.0 min
S	38.0
T	163.0 ± 0.5
U	94.0
V	200.0

Outline Notes

1. The holes are for socket screws which retain the lifting handles (not shown). The handles should be removed before switching on the tube.
2. Eight slots 9.0 mm x 18.0 mm for M8 bolts.

Water Connections

	Anode down	**Anode up**
Inlet	1	2
Outlet	2	1

