Teledyne e2v

CX1191D
Deuterium Thyratron

The data to be read in conjunction with the Hydrogen Thyratron Preamble.

ABRIDGED DATA

Deuterium-filled tetrode thyratron of ruggedised construction, suitable for general switching applications. It is used for switching peak powers up to 8.0 MW at high repetition rates under a wide range of operating conditions. It has a rugged, internally connected reservoir.

Peak forward anode voltage	-	35 kV max
Peak anode current	-	500 A max
Average anode current	-	0.5 A max
Anode heating factor	-	8.0×10^9 VApps max
Peak output power	-	8.0 MW max

GENERAL DATA

Electrical

Cathode (connected internally to mid-point of the heater)	-	Oxide coated
Heater voltage	-	6.3 ± 7.5% V
Heater current	-	12.5 A
Tube heating time (minimum) (see note 1)	-	5.0 min
Inter-electrode capacitances		
Anode to grid 2 (grid 1 and cathode	-	9.0 pF
Anode to grid 1 (grid 2 and cathode not	-	4.5 pF
Anode to cathode (grid 1 and grid 2 not connected)	-	18 pF

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Mechanical

Overall length	-	231.4 mm (9.108 inches) max
Overall diameter	-	65.1 mm (2.562 inches) max
Net weight	-	340 g (12 ounces) approx.
Mounting position (see note 2)	-	Any
Base	-	B4D, bayonet
Top cap (see note 2)	-	BS448-CT3
Cooling (see note 3)	-	Natural

PULSE MODULATOR SERVICE

MAXIMUM AND MINIMUM RATINGS
(Absolute values)

Anode	**Min**	**Max**

Peak forward anode voltage (see note 1)	.	-	35	kV
Peak inverse anode voltage (see note 4)	.	-	10	kV
Peak anode current	.	-	500	A
Average anode current	.	-	0.5	A
Rate of rise of anode current (see note 5)	.	-	2500	A/µs
Anode heating factor	.	-	8.0×10^9	VApps

Grid 2		**Min**	**Max**	
Unloaded grid 2 drive pulse voltage (see note 6)	.	200	750	V
Grid 2 pulse duration	.	1.0	-	µs
Rate of rise of grid 2 pulse (see note 5)	.	1.0	-	kV/µs
Grid 2 pulse delay	.	0.5	3.0	µs
Peak inverse grid 2 voltage	.	-	200	V
Loaded grid 2 bias voltage	.	-50	-120	V
Forward impedance of grid 2 drive circuit	.	100	1000	Ω

Grid 1 – DC Primed (see note 7)		**Min**	**Max**	
DC grid 1 unloaded priming voltage	.	75	150	V
DC grid 1 priming current	.	50	100	mA

Grid 1 – Pulsed		**Min**	**Max**	
Unloaded grid 1 drive pulse voltage (see note 6)	.	300	750	V
Grid 1 pulse duration	.	2.0	-	µs
Rate of rise of grid 1 pulse (see note 5)	.	1.0	-	kV/µs
Peak inverse grid 1 voltage	.	-	200	V
Loaded grid 1 bias voltage	.	See note 8		
Peak grid 1 drive current	.	0.3	1.0	A

Cathode		**Min**	**Max**	
Heater voltage	.	6.3 ± 7.5%		V
Tube heating time	.	5.0	-	min

Environmental		**Min**	**Max**	
Ambient temperature	.	-50	+90	°C

Altitude	.	- -	3 10,000	km ft

CHARACTERISTICS

		Min	Typ	Max	
Critical DC anode voltage for conduction (see note 9)	.	-	0.3	1.0	kV
Anode delay time (see notes 9 and 10)	.	-	0.15	0.25	µs
Anode delay drift time (see notes 9, 11 and 12)	.	-	20	50	ns
Time jitter (see notes 9 and 12)	.	-	1.0	5.0	ns
Heater current (at 6.3 V)	.	11	12.5	13	A

RATINGS FOR FAULT CONDITIONS, SINGLE-SHOT OR CROWBAR SERVICE
(See note 7)

DC forward anode voltage (see note 1)	-	35 kV max
Peak anode current	-	5000 A max
Product of peak current and pulse duration	-	0.2 A.s max
Repetition frequency	-	1 pulse per 10 s max

NOTES

1. The maximum permissible peak forward voltage for instantaneous starting is 20 kV and there must be no overshoot.
   For single-shot and crowbar applications, each tube is tested to withstand 35 kV DC at 6.3 V heater voltage for 10 minutes, with 100 mA grid 1 drive current and −100 V grid 2 bias.

2. Clamping is only permissible by the base.

3. In some applications, air cooling may be necessary to prevent the base temperature from exceeding 200 °C.

4. The peak inverse voltage must not exceed 25 kV for the first 25 µs after the anode pulse.

5. This rate of rise refers to that part of the leading edge of the pulse between 25% and 75% of the pulse amplitude.

6. Measured with respect to cathode. In certain cases the maximum drive pulse voltage may be exceeded without damage to the tube; a maximum value of 2.5 kV is then recommended. When grid 1 is pulse driven, the last 0.25 µs of the top of the grid 1 pulse must overlap the corresponding first 0.25 µs of the top of the delayed grid 2 pulse.

7. When DC priming is used on grid 1, a negative bias of 100 to 200 V must be applied to grid 2 to ensure anode voltage hold-off. DC priming is recommended for pulse modulator and crowbar service.

8. DC negative bias voltages must not be applied to grid 1. When grid 1 is pulse driven, the potential of grid 1 may vary between −10 and +5 V with respect to cathode potential during the period between the completion of recovery and the commencement of the succeeding grid pulse.

9. Typical figures are obtained on test using conditions of minimum grid drive. Improved performance can be expected by increasing the grid drive.

10. The time interval between the instant at which the rising unloaded grid 2 pulse reaches 25% of its pulse amplitude and the instant when anode conduction takes place.

11. The drift in delay time over a period from 10 seconds to 10 minutes after reaching full voltage.

12. For equipment where jitter and anode delay time drift are not important, the tube may be triggered by applying a single pulse to grid 2 and connecting grid 1 to grid 2 via a 1000 pF capacitor shunted by a 0.1 MΩ resistor.

HEALTH AND SAFETY HAZARDS

e2v technologies thyratrons are safe to handle and operate, provided that the relevant precautions stated herein 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 equipment incorporating e2v technologies devices and in operating manuals.

High Voltage

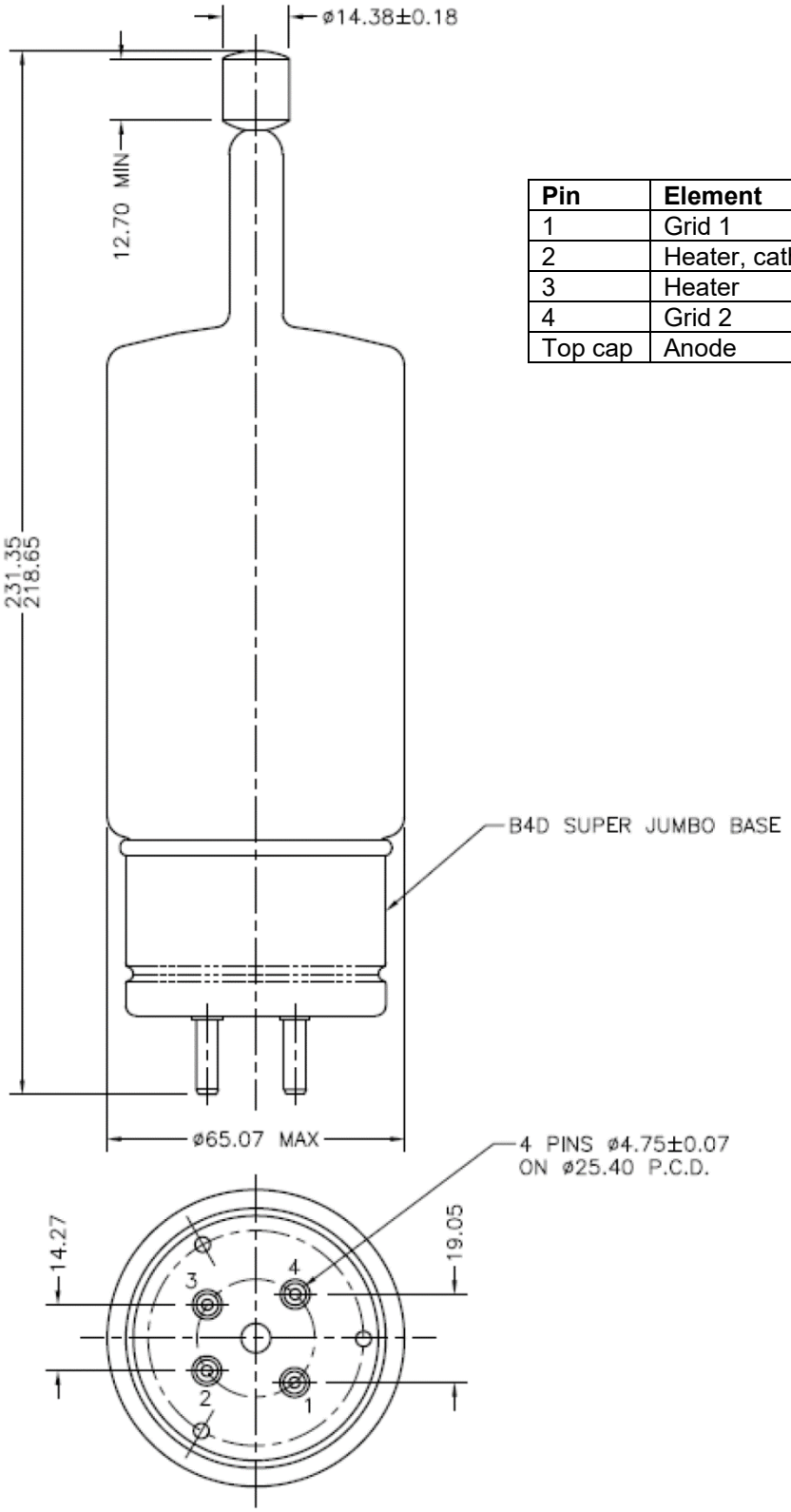
Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and other stored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

X-Ray Radiation

All high voltage devices produce X-rays during operation and may require shielding. The X-ray radiation from hydrogen thyratrons is usually reduced to a safe level by enclosing the equipment or shielding the thyratron with at least 1.6 mm (1/16 inch) thick steel panels.
Users and equipment manufacturers must check the radiation level under their maximum operating conditions.

OUTLINE

(All dimensions without limits are nominal)



Pin	Element
1	Grid 1
2	Heater, cathode
3	Heater
4	Grid 2
Top cap	Anode