Teledyne e2v

CX1159G
Deuterium Thyratron

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

ABRIDGED DATA

Deuterium-filled tetrode thyratron, featuring low jitter and low anode delay time drift. Suitable for use at high pulse repetition rates or for switching long pulses. A reservoir operating from the cathode heater supply is incorporated.

Peak forward anode voltage	-	33 kV max
Peak anode current (see page 2)	-	1000 A max
Average anode current	-	1.25 A max

GENERAL DATA

Electrical

Cathode (connected internally to mid-point of the heater)	-	Oxide coated
Heater voltage	-	6.3 + 0.2 V - 0.3 V
Heater current	-	22 A
Tube heating time (minimum)	-	5.0 min
Inter-electrode capacitances (approximate):		
Anode to grid 2 (grid 1 and cathode not connected)	-	13 pF
Anode to grid 1 (grid 2 and cathode not connected)	-	7.5 pF
Anode to cathode (grid 1 and grid 2 not connected)	-	26 pF

Mechanical

Overall length	-	317.5 mm (12.500 inches) max
Overall diameter	-	84.12 mm (3.312 inches) max
Net weight	-	0.7 kg (1.5 pounds) approx.
Mounting position (see note 1)	-	any
Base	-	Pin spacing as B5F
Top cap (see note 2)	-	BS448-CT3

CX1159G is also available with a metal flange base with flexible leads as type CX1551G.

Cooling	-	Natural

Teledyne UK Limited, Waterhouse Lane, Chelmsford, Essex CM1 2QU United Kingdom Teledyne UK Ltd. is a Teledyne Technologies company.
Telephone: +44 (0)1245 493493 Facsimile: +44 (0)1245 492492
Contact Teledyne e2v by e-mail: Enquiries@Teledyne-e2v.com or visit www.teledyne-e2v.com for global sales and operations centres.

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PULSE MODULATOR SERVICE

MAXIMUM AND MINIMUM RATINGS (Absolute values)

Anode		Min	Max	
Peak forward anode voltage (see note 3)	.	-	33	kV
Peak inverse anode voltage (see note 4)	.	-	25	kV
Peak anode current	.	-	1000	A
Peak anode current (pulse repetition rate limited to 60 pps max)	.	-	2000	A
Average anode current (see note 5)	.	-	1.25	A
Rate of rise of anode current (see note 6)	.	-	5000	A/µs
Anode heating factor	.	-	14 x 10^9	VApps

Grid 2		Min	Max	
Unloaded grid 2 drive pulse voltage (see note 7)	.	200	1000	V
Grid 2 pulse duration	.	1.0	-	µs
Rate of rise of grid 2 pulse (see note 6)	.	1.0	-	kV/µs
Grid 2 pulse delay	.	0.5	3.0	µs
Peak inverse grid 2 voltage	.	-	450	V
Loaded grid 2 bias voltage	.	-50	-150	V
Forward impedance of grid 2 drive circuit	.	50	800	Ω

Grid 1 – DC Primed (see note 8)		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 7)	.	300	1000	V
Grid 1 pulse duration	.	2.0	-	µs
Rate of rise of grid 1 pulse (see note 6)	.	1.0	-	kV/µs
Peak inverse grid 1 voltage	.	-	450	V
Loaded grid 1 bias voltage	.	See note 9		
Peak grid 1 drive current	.	0.3	1.0	A

Cathode		Min	Max	
Heater voltage	.	6.3	+ 0.2 - 0.3	V V
Tube heating time	.	5.0	-	min

Environmental		Min	Max	
Ambient temperature	.	-50	+90	°C
Altitude	.	- -	3 10,000	km ft

CHARACTERISTICS

Anode		Min	Typ	Max	
Critical DC anode voltage for conduction (see note 10)	.	-	0.5	2.0	kV
Anode delay time (see notes 10 and 11)	.	-	0.15	0.25	µs
Anode delay time drift (see notes 10 and 12)	.	-	20	50	ns
Time jitter (see note 10)	.	-	5.0	10.0	ns
Recovery time	.	See graph, page 5			
Heater current (6.3V)	.	18	22	25	A

RATINGS FOR SINGLE-SHOT OR CROWBAR SERVICE (see note 8)

DC forward anode voltage	-	25 kV max
Peak anode current	-	15,000 A max
Product of peak current and pulse duration	-	0.6 A.s max
Repetition frequency	-	1 pulse per 10 s max

NOTES

1. Clamping is only permissible by the base.

2. A large area anode connector, Teledyne e2v type MA360, is recommended.

3. The maximum permissible peak forward voltage for instantaneous starting is 20 kV and there must be no overshoot.

4. The peak inverse voltage must not exceed 10 kV for the first 25 µs after the anode pulse.

5. For inverter type applications where the peak current does not exceed 50 A, the maximum average anode current may be increased to 2.5 A; Teledyne e2v should be consulted.

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

7. 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.

8. 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 crowbar service.

9. 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.

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

11. 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.

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

BASE SOCKET ASSEMBLIES

In addition to standard top cap connectors, two base socket assemblies are available from Teledyne-e2v.

MA9IC
A five-contact base socket fitted with solder tags.

MA92
A five-contact base socket fitted with flexible leads and terminal tags and mounted on an insulating base plate. It provides a conversion from socket to flange mounting and also incorporates an RC network for the grid drive. It is designed for use with the CX1159G where a single pulse drive and flexible lead connections are required.

CX1159G is also available with a metal flange mounting and flexible leads as type CX1551G

Further information is contained in the leaflet 'Accessories for Hydrogen Thyratrons'

HEALTH AND SAFETY HAZARDS

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

High Voltage

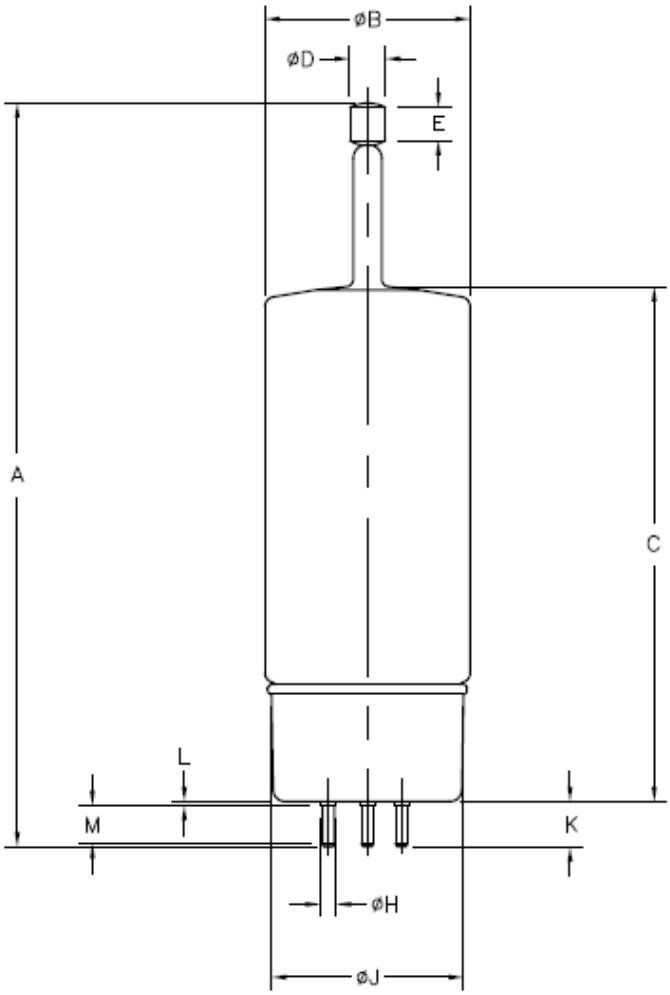
Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and other stored 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 condition.

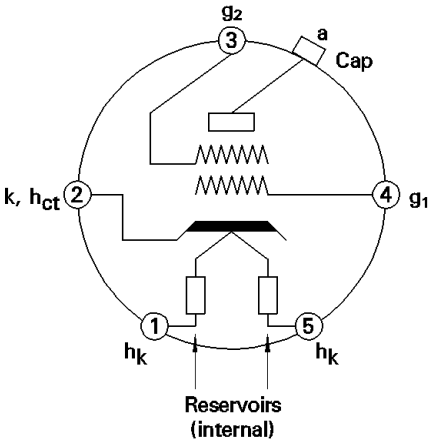
OUTLINE

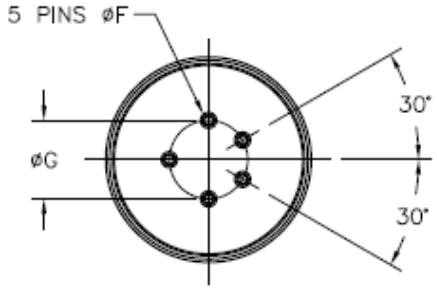
(All dimensions without limits are nominal)



Ref	Millimetres	Inches
A	304.8 ± 12.7	12.000 ± 0.500
B	84.12 max	3.312 max
C	215.9 ± 12.7	8.500 ± 0.500
D	14.38 ± 0.18	0.566 ± 0.008
E	12.7 min	0.500 min
F	4.75 ± 0.076	0.187 ± 0.003
G	31.75	1.250
H	6.6 max	0.260 max
J	77.7 ± 1.57	3.062 ± 0.062
K	19.56 max	0.770 max
L	1.85 max	0.073 max
M	14.6 min	0.575 min

Inch dimensions have been derived from millimetres.





Pin	Element
1	Heater
2	Cathode, connected internally to heater mid-point
3	Grid 2
4	Grid 1
5	Heater
Top cap	Anode

MAXIMUM RECOVERY CHARACTERISTICS