e2v technologies

FX11A
Hydrogen-Filled Ceramic Thyratron

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

ABRIDGED DATA

Hydrogen-filled triode thyratron with ceramic envelope, featuring low jitter, low anode delay time drift and high rate of rise of current. A hydrogen reservoir operating from a separate heater supply is incorporated.

Peak forward anode voltage	18	kV max
Peak anode current	5000	A max
Average anode current	250	mA max

GENERAL DATA

Electrical

Cathode (connected internally to one end of heater)	oxide coated	
Cathode heater voltage	6.3 ± 5%	V
Cathode heater current	6.0	A
Reservoir heater voltage (see note 1)	6.3 ± 5%	V
Reservoir heater current	1.7	A
Tube heating time (minimum)	4.0	min

Mechanical

Seated height	63 mm (2.480 inches) max
Clearance required below mounting flange	22 mm (0.866 inches) min
Overall diameter (mounting flange)	82.55 mm (3.250 inches) nom
Net weight	300 g (10.6 ounces) approx
Mounting position (see note 2)	any
Tube connections	see outline

Cooling . . . . . natural, forced-air or liquid

Where natural cooling is insufficient to maintain the envelope temperatures below the specified rated values, cooling by forced-air or by oil or coolant immersion may be used.

The temperature of the anode terminal and the base, measured at the points indicated on the outline drawing, must not exceed the value specified below.

Maximum temperature of envelope	200 °C

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PULSE MODULATOR SERVICE MAXIMUM AND MINIMUM RATINGS

(Absolute values)

	Min	Max	
Anode			
Peak forward anode voltage	–	18	kV
Peak anode current	–	5000	A
Average anode current	–	250	mA
Rate of rise of anode current (see note 3)	–	250	kA/μs
Grid			
Unloaded grid drive pulse voltage (see note 4)	240	1000	V
Grid pulse duration	2.0	–	μs
Rate of rise of grid pulse (see note 3)	1.0	–	kV/μs
Peak inverse grid voltage	–	200	V
Loaded grid bias voltage (see note 5)	0	−100	V
Forward impedance of grid drive circuit	100	500	Ω
Cathode			
Heater voltage	6.3 ± 5%		V
Heating time	4.0	–	min
Reservoir			
Heater voltage (see note 1)	6.3 ± 5%		V
Heating time	4.0	–	min
Environmental			
Ambient temperature	−15	+50	°C
Altitude	–	3.7	km
	–	12 000	ft

CHARACTERISTICS

	Min	Typical	Max	
Critical DC anode voltage for conduction (see note 6)	–	0.5	1.0	kV
Anode delay time (see notes 6 and 7)	–	0.15	0.4	μs
Anode delay time drift (see notes 6 and 8)	–	20	100	ns
Time jitter (see note 6)	–	1.0	5.0	ns
Heater current (at 6.3 V)	5	6	7	A
Reservoir current (at 6.3 V)	1.0	1.7	2.5	A

NOTES

1. The reservoir heater supply must be decoupled with a suitable capacitor to avoid damage to the reservoir heater by spike voltages.
2. The tube must be mounted by means of its mounting flange.
3. This rate of rise refers to that part of the leading edge of the pulse between 10% and 90% of the pulse amplitude.
4. Measured with respect to cathode potential.
5. The FX11A is tested with 0 V bias on the grid. However it is recommended that negative bias be applied to the grid at the level of −30 V (minimum) for continuous operation, particularly at high repetition rates.
6. Typical figures are obtained on test using conditions of minimum grid drive. Improved performance can be expected by increasing the grid drive.
7. The time interval between the instant at which the rising unloaded grid pulse reaches 25% of its pulse amplitude and the instant when anode conduction takes place.
8. The drift in delay time over a period from 2 minutes to 10 minutes after reaching full voltage.

HEALTH AND SAFETY HAZARDS

e2v technologies hydrogen 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 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 charges before allowing access. Interlock switches must not be bypassed to allow operation with access doors 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.

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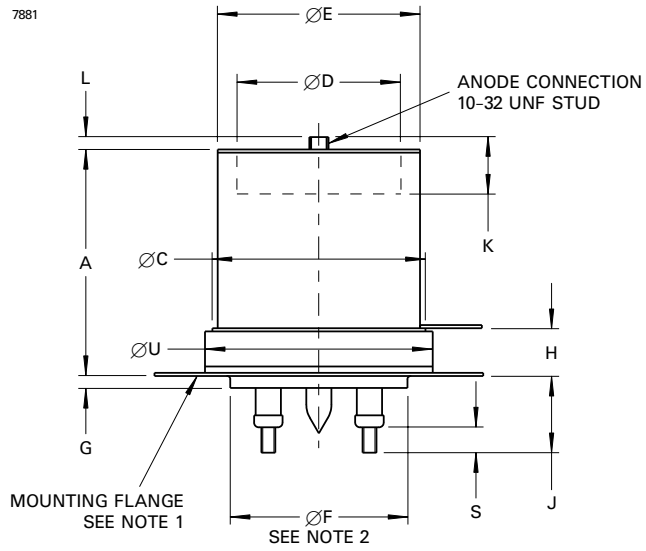
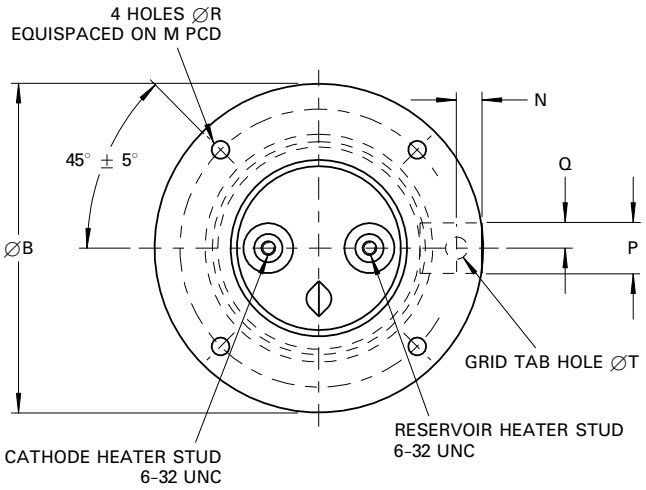
OUTLINE
(All dimensions without limits are nominal)





Ref	Millimetres	Inches
A	57.40 ± 2.06	2.260 ± 0.081
B	82.55	3.250
C	53.98	2.125
D	41.15 ± 1.52	1.620 ± 0.060
E	50.80 ± 0.76	2.000 ± 0.030
F	47.63 max	1.875 max
G	3.81 max	0.150 max
H	12.70 ± 1.27	0.500 ± 0.050
J	27.56 max	1.085 max
K	14.61 ± 1.91	0.575 ± 0.075
L	3.18 ± 0.38	0.125 ± 0.015
M	69.85	2.750
N	6.35	0.250
P	12.7	0.500
Q	6.35	0.250
R	4.8	0.189
S	6.35	0.250
T	5.6	0.220
U	57.15 ± 0.76	2.250 ± 0.030

Inch dimensions have been derived from millimetres.

Outline Notes

1. The mounting flange is the connection for the cathode, cathode heater return and reservoir heater return.
2. The recommended mounting hole is 50.8 mm (2 inches) diameter.

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