DATASHEET

HY-3189

Deuterium Thyratron

Description

The HY-3189 is a deuterium-filled, triode thyratron. The deuterium gas fill facilitates reliable operation at the higher voltage and low to moderate pulse repetition rate that is commonly employed in applications such as high power pulsed lasers. High pulse currents are achievable using only free or forced air convection cooling. The tube may be mounted by its cathode mounting flange in any position.

SPECIFICATIONS

ABSOLUTE RATINGS (MAXIMUMS)(NONSIMULTANEOUS)

epy, Peak Forward Anode Voltage(Notes 1, 2 & 3)	40 kv
ib, Peak Forward Anode Current(Notes 4, 5 & 6)	5 ka
ibx, Peak Reverse Anode Current(Note 7)	.1 ib
epx, Peak Reverse Anode Voltage(Note 8)	20 kV
epy Min., Minimum Anode Supply Voltage	1 kV DC
tp, Anode Current Pulse Duration(Note 5)	10 µsec.
Ib, Average Anode Current	2.2 Adc
Ip, RMS Average Current(Note 9)	47.5 Aac
Pb, Anode Dissipation Factor (V x A x pps)(Note 10)	$50x10^9$
tr, Maximum Anode Current Rise Rate	$1X10^{11}$a/sec

PULSED LASER SERVICE(Note 11)
TYPICAL, SIMULTANEOUS OPERATING CONDITIONS

epy, Peak Forward Anode Voltage	30 kv
ib, Peak Forward Anode Current	4 ka
tp, Anode Current Pulse Duration	0.35 µsec.
Prr, Pulse Repetition Rate	400 Hz
Ib, Average Anode Current	0.56 Adc
Ip, RMS Average Current	47.3 Aac
Pb, Anode Dissipation Factor (V x A x pps)	$48x10^9$
tr, Maximum Anode Current Rise Rate	$1x10^{11}$a/sec

GENERAL ELECTRICAL DATA

Ef, Cathode Heater Voltage (Vac)	6.3 ± 5%
If, Nom. Cathode Heater Current @ Ef = 6.3Vac, (Aac)	12.5
Er, Reservoir Heater Voltage, Nominal (Vac)(Note 12)	6.3
Ir, Nom. Reservoir Heater Current @ Er = 6.3Vac (Aac)	5.5
tk, Tube Warm-Up Time (Minimum Minutes)	5

PerkinElmer™ optoelectronics.

TRIGGERING REQUIREMENTS

	MIN.	TYP.	MAX.
egy, Peak Open Circuit Trigger Voltage (Forward) (V)	500	750	1500
Zg, Driver Circuit Output Impedance (Ohms)	---	100	250
Driver Pulse Rise Time (ns)	---	100	150
Driver Pulse Width (µs)	1	2	---
Peak Reverse Grid Voltage (V)	---	---	400
Bias Voltage (Negative) (V)	---	---	300
Anode Delay Time (nS)[Notes 13 & 14]	---	---	500
Anode Delay Time Drift (nS)[Note 14]	---	---	150
Time Jitter (nS)[Note 14]	---	---	5

NOTES

1. The dwell time at the peak anode voltage should be minimized in order to minimize prefiring. For operation at the rated epy, the dwell time must not exceed 1 millisecond.

2. After thyratron anode current stops flowing and before voltage is reapplied to the anode, the anode voltage must stay between 0 and -500 volts for at least 300 µS to allow the gas to deionize.

3. This tube may be operated in air at up to 35 kv. Some of the more important derating factors that determine the safe operating voltage in air are the cleanliness of the tube's ceramic insulators, the rate of rise of anode voltage, the dwell time at the operating peak anode voltage, the pulse repetition rate, and ambient pressure, temperature, humidity and contaminant level. This tube may also be operated while immersed in an insulating gas or liquid.

4. The peak current capability of 5 ka applies to, short pulse (tp < 0.3 µs) duration applications.

5. The pulse width is measured on the discharge current waveform at the half peak current level.

6. For anode current pulse widths greater than 0.3 microseconds but less than 10 microseconds, a useful formula for estimating the allowable peak current is ib = ib0 (3/tp)1/2 amps, where tp is the pulse width in microseconds, and ib0, the peak current rating at tp = 3 microseconds, is 1,500 amps for this tube.

7. Although this tube is not designed for high reverse peak current applications, the tube may conduct a peak reverse current having a magnitude up to 10% of the forward current on the preceding half cycle of the discharge current waveform.

8. The reverse anode voltage shown applies for a previously non-conducting tube. Exclusive only of a spike not longer than 25 nanoseconds, the peak reverse anode voltage must not exceed 5kv during the first 50 microseconds after conduction.

9. Ip is the true root mean square (RMS) current. For relatively rectangular shaped current pulses without a reverse current, the RMS anode current may be approximated as the square root of the product of the peak current and the average current.

10. Forced air or liquid immersion cooling should always be used in any situation where cooling by natural convection is insufficient to keep the temperature of the tube's envelope below 200°C. Typically, a room temperature air flow of 50 to 150 cfm directed into the anode cup will be sufficient. When the tube is cooled by immersion in a force-circulated liquid coolant, the anode dissipation factor may be tripled provided that the envelope temperature does not exceed 200°C.

11. Typical, simultaneous operating conditions other than the example shown in this data sheet might also be acceptable. The conditions shown herein produce a discharge currentwaveform of the peak forward anode current shown with less than a 10% current reversal. The pulse width is measured at the half peak current level. The RMS current is approximated using the relationship shown in note 9. The average current is the product of the stored charge (in the pfn being switched by the thyratron) and the pulse repetition rate.

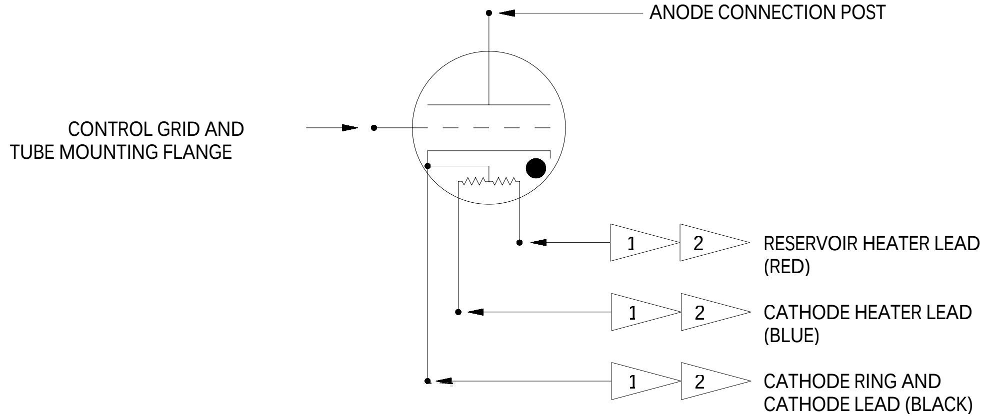
12. The optimum reservoir heater voltage is that which provides the best overall compromise among anode heating, anode voltage holdoff and holdoff recovery, anode current rise rate, and the tube's overall triggering characteristics. For most applications, the optimum reservoir heater voltage lies between 90% and 110% of the nominal value. Operation at voltages below 90% of nominal can result in permanent damage from anode overheating; operation at high reservoir heater voltages degrades anode holdoff and holdoff recovery, and can permanently damage the reservoir itself.

13. The anode delay time is measured from the 25% point on the rise of the unloaded grid voltage pulse to the 10% point on the rise of the anode current pulse.

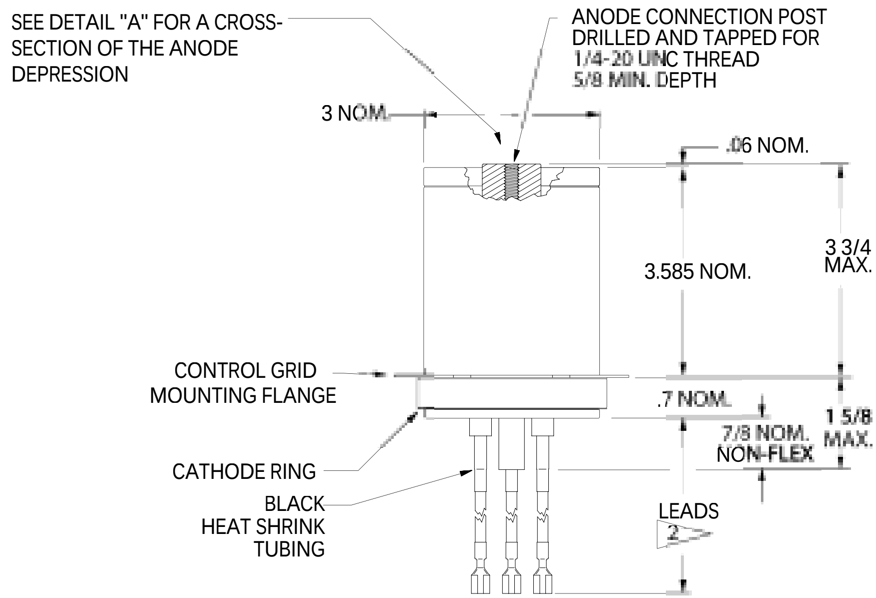
14. Delay time, delay time drift and time jitter may be simultaneously minimized by applying the maximum grid drive voltage (egy) at a high rate of rise of voltage from a source of low impedance (Zg).

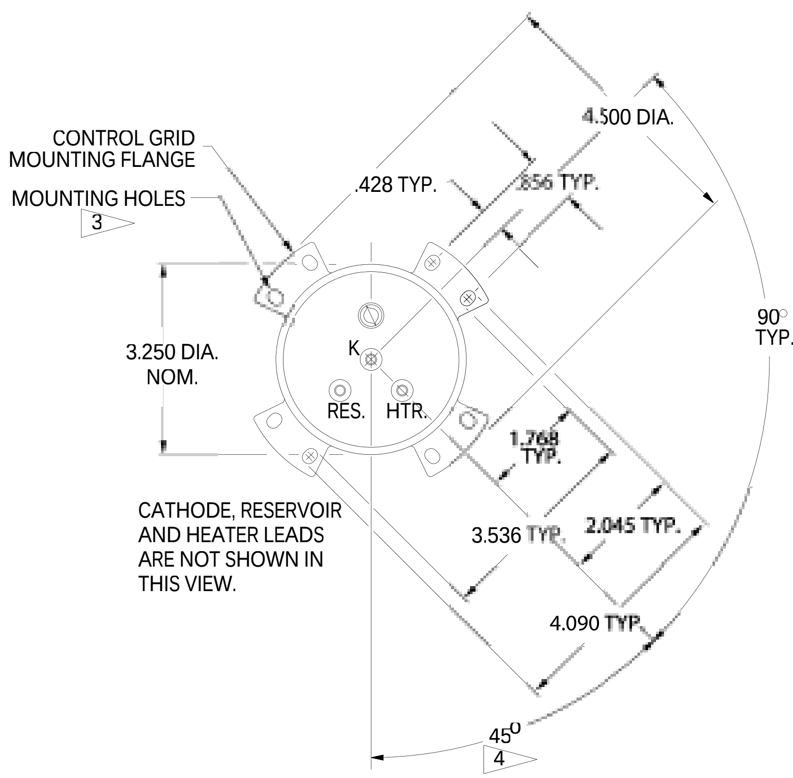
15. All data and specifications are subject to change without notice.

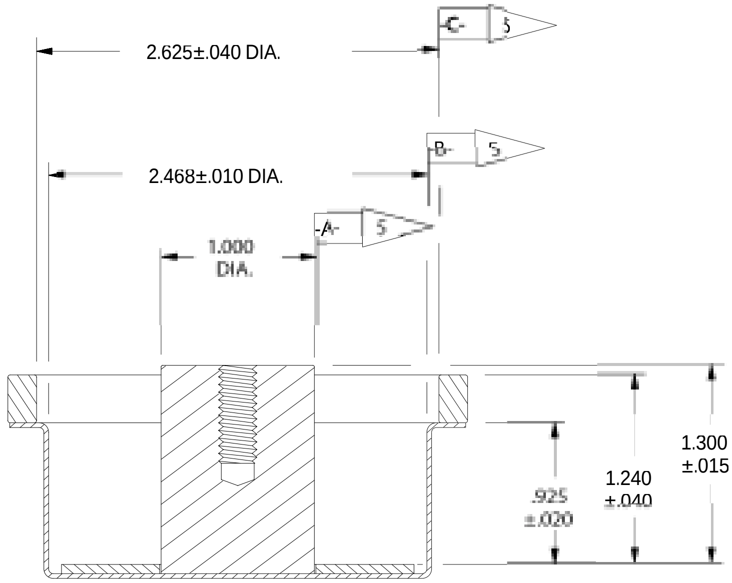
16. Data sheet origination date is shown on the front page. This data sheet becomes obsolete when more recent revisions are published.



TUBE SCHEMATIC SYMBOL







DETAIL "A"

NOTES

1. RESERVOIR AND CATHODE HEATERS HAVE ONE SIDE CONNECTED TO THE CATHODE INTERNAL TO THE TUBE ENVELOPE.

2. THE LEADS ARE 10+0.5,-0.0 INCHES LONG AND SUPPLIED WITH THOMAS & BETTS FEMALE INSULATED DISCONNECTS TYPE 10RC-2577 OR EQUIVILANT. THE LEADS ARE FLEXIBLE FROM A POINT 7/8 BELOW THE CERAMIC BASE TO THE DISCONNECT AT THE END OF THE LEAD. THE LEADS ARE COLOR CODED AS FOLLOWS.

BLACK	-	CATHODE, K
BLUE	-	CATHODE HEATER, HTR.
RED	-	RESERVOIR HEATER, RES.

3. THE MOUNTING HOLES ARE SLOTTED. THE SLOT WIDTH IS .219 REF. THE ENDS OF THE SLOTS HAVE A FULL RADIUS. THE SLOTTED HOLES ARE LOCATED ON THE CONTROL GRID MOUNTING FLANGE AND POSITIONED AS SHOWN.

4. THE RELATIVE ANGULAR ORIENTATION BETWEEN THE CONTROL GRID MOUNTING FLANGE AND OTHER FEATURES OF THE TUBE IS HELD TO WITHIN 10 DEGREES.

5. SURFACES -A-, -B-, -C- ARE CONCENTRIC TO EACH OTHER WITHIN .020 TIR.

6. DO NOT USE METAL CLAMPS ON THE CERAMIC ENVELOPE.

7. .040 R. MAX. FILLET AT SOLDER JOINTS. SOLDER FILM MAY EXTEND BEYOND THE FILLET LIMITS.

For more information email us at opto@perkinelmer.com or visit our web site at www.perkinelmer.com/opto
Note: All specifications subject to change without notice.

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