

INCH-POUND

MIL-PRF-1/1371H  
16 July 2004  
SUPERSEDING  
MIL-PRF-1/1371G  
19 July 1999

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, THYRATRON  
TYPE 7322

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the electron tube described herein shall consist of this document and the latest issue of MIL-PRF-1.

**DESCRIPTION:** Triode, hydrogen, ceramic-metal.

See figure 1 and 1/.

Mounting position: Any.

Weight: 2 pounds (907.2 grams) nominal.

**ABSOLUTE RATINGS:**

Parameter:	Ef	Eres	Ebb	Ecc	epy	epx	egy	egx	Ib
Unit:	V	V ac	V dc	V dc	kv	kv	v	v	A
Maximum:	6.8	6.8	---	-200	25	25	1,500	400	2.0
Minimum:	5.8	5.8	1,500	0	--- 2/	5% epy 3/	500 4/	--- 5/	---
Test conditions:	6.3	6.3	---	0	25	---	450	---	---

**ABSOLUTE RATINGS:**

Parameter:	Ip	ib	dik/dt	Pb	pr	tj	tk	TA	Cooling
Unit:	A ac	a	a/ $\mu$ s	---	---	$\mu$ s	sec	$^{\circ}$ C	---
Maximum:	36	1,000	5,000	$20 \times 10^9$	---	0.005	---	+125	6/
Minimum:	---	---	---	---	---	---	---	-55	---
Test conditions:	---	---	---	---	500	---	600	Ambient	---

See footnotes at end of table I.

**GENERAL:**

Qualification: Required.

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TABLE I. Testing and inspection.

Inspection	Method MIL-STD- 1311	Notes	Conditions	Acceptance Level <u>18</u> /	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 1</u>								
Instantaneous starting	3267	<u>7/ 8</u> /	Ef = Eres = 6.8 V ac; epy = 18 kv (min); first test after holding period	0.65	---	---	---	---
Operation (1)	3246	<u>7/ 9</u> /	Ef = Eres = 5.8 V ac; epy = 27.5 kv; second test after holding period	0.65	---	---	---	---
DC anode voltage for conduction	3247	---	Ef = Eres = 5.8 V ac	0.65	Ebb	---	1,000	V dc
Operation (2A)	3246	---	Operation (2), except Ef = Eres = 6.8 V ac	0.65	---	---	---	---
<u>Conformance inspection, part 2</u>								
Heater current (cathode)	3241	---		---	If	11.0	22.0	A ac
Heater current (reservoir)	3241	---		---	Ires	3.0	6.0	A ac
Operation (1A)	3246	---	Operation (1), except Ef = Eres = 6.8 V ac; t = 20 minutes	---	---	---	---	---
Anode delay time	3256	---	Operation (1); t = 120	---	tad	---	0.5	μs
Anode delay time drift	3256	<u>11</u> /	Anode delay time	---	Δtad	---	0.15	μs
Time jitter	3261	<u>12</u> /	Operation (1); Ef = Eres = 5.8 V ac	---	tj	---	0.005	μs
Operation (2)	3246	<u>13</u> /	Ef = Eres = 5.8 V ac; epy = 20 kv; pr = 1,500	---	---	---	---	---
Pulse emission	3251	---	ik = 1,500 a; tp = 5.0 μs ± 10 percent; pr = 60 ± 10 percent; tr = 0.5 μs (max); starting time of current pulse = 2.5 μs	---	egk	---	250	v

See footnotes at end of table.

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TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD- 1311	Notes	Conditions	Acceptance Level <u>18/</u>	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 3</u>								
Life test (1)	---	<u>7/ 14/ 15/</u>	Group C; t = 500 hours	---	---	---	---	---
Life-test (2)	---	<u>13/ 14/ 15/</u>	Group C; t = 500 hours	---	---	---	---	---
Life-test (1) and (2) end points:	---							
Operation (1) and (1A) except <u>13/</u>	3246	---		---	egy	---	450	v
DC anode voltage for conduction	3247	---		---	Ebb	---	1,250	V dc
Time jitter	3261	---		---	tj	---	0.005	μs
Operation at elevated ambient temperature	3246	<u>7/ 16/ 17/</u>	TA = 125°C	---	t	5	---	hrs
Operation (4)	3246	<u>17/</u>	epy = 13.5 kv (min); ib = 100a (min); lb = 2.0 A (min); Pb = 0.4 x 10 <sup>9</sup> (min); tp = 60 μs ± 10 percent; tr = 2.5 μs (max); grid pulse same as <u>7/</u>	---	---	---	---	---
Operation (5)	3246	<u>10/ 17/</u>		---	---	---	---	---
Sweep frequency vibration	1031	<u>17/</u>	No voltages applied	---	---	---	---	---
Shock	1041	<u>17/</u>	Accel = 250 G; no voltages applied	---	---	---	---	---
Shock and vibration end points:	---							
DC anode voltage for conduction	3247	---		---	Ebb	---	1,250	V dc
Operation (1)	3246	---		---	egy	---	450	v
Time jitter	3261	---		---	tj	---	0.005	μs
Life test (3)	---	<u>14/ 17/</u>	Operation (4); t = 500 hours	---	---	---	---	---
Life test (3) end points:	---							
Operation (4)	3246	---		---	egy	---	450	v
Dc anode voltage for conduction	3246	---		---	Ebb	---	1,250	V dc

See footnotes at top of next page.

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TABLE I. Testing and inspection - Continued.

- 1/ An MT-4 mounting assembly (or equivalent) shall be provided as an integral part of each tube. (See figures 2 and 3 for reference only.)
- 2/ Instantaneous starting is permissible. The maximum permissible instantaneously applied epy is 18.0 kv and shall be attained in not less than 0.04 second. The epy may then be raised to full rating.
- 3/ In pulsed operation, the peak inverse voltage exclusive of a spike of 0.05  $\mu$ s maximum duration, shall not exceed 5.0 kv during the first 25  $\mu$ s following the anode pulse.
- 4/ The driver pulse, measured at tube socket with thyatron grid disconnected:  $t_r = 0.35 \mu$ s maximum, grid pulse duration = 2.0  $\mu$ s minimum. Impedance of drive circuit 50 to 400 ohms.
- 5/ A maximum backswing voltage of 650 volts on the grid of the thyatron is permissible immediately after the trigger pulse.
- 6/ There shall be no forced-air cooling which will reduce T (anode) or TE below 150°C. At average current levels exceeding 1.5 amperes when the Pb factor exceeds  $10 \times 10^9$ , cooling of the tube is necessary by means of an anode radiator, forced air, or both. Radiator design for operation at  $I_b = 2.0$  A dc and  $P_b = 20 \times 10^9$  shall be such that the center of the upper radiator surface shall not exceed 200°C under operation. A cooling airblast of 10 cfm may be directed into the anode cup.
- 7/ The circuit constants shall be chosen under resonant charging conditions so that: epy = 25 kv;  $i_b = 1,000$  a minimum;  $dik/dt = 5,000$  a/ $\mu$ s minimum;  $t_p = 2.5 \pm 0.25 \mu$ s; prr = 500 minimum. Grid pulse shall have the following characteristics:  $t_r = 0.35 \mu$ s minimum,  $t_p = 2.0 \mu$ s maximum,  $Z_s = 50$  to 400 ohms.
- 8/ The tube shall operate satisfactorily on pushbutton starting within three attempts when the epy is applied to the tube under test in such a manner as to rise from 0 to 18 kv minimum within 0.03 second. The filter in the rectifier shall be designed so that the epy reaches at least 9 kv within 0.015 second.) Any tube failing to start within three attempts will be considered a failure.
- 9/ The tube shall operate continuously for 30 minutes without evidence of arc-back, with not more than three kickouts during the first minute of operation.
- 10/ Reduce the ambient temperature to -55°C in not less than 30 minutes. After 15 minutes soaking, tubes shall perform to operation (1) conditions, except  $E_f = E_{res} = 6.3$  V.
- 11/ This test shall be performed simultaneously with the operation (1) test. An anode delay time measurement shall be made at the end of 2 minutes, 4 minutes, and 30 minutes of the operation (1) test. The  $\Delta t_{ad}$  measurement is the numerical difference between the 2-minute and 4-minute, or 2-minute and 30-minute  $t_{ad}$  readings, whichever is greater.
- 12/ The tube shall be tested by applying a peak forward anode voltage not to exceed that specified in the test conditions for the time jitter test immediately after the  $t_k$ . The  $t_j$  shall be not greater than the amount specified after 120 seconds of operation.
- 13/ The anode circuit constant shall be so chosen that the epy = 20 kv;  $i_b = 667$ a minimum;  $dik/dt = 5,000$  a/ $\mu$ s minimum;  $t_p = 1.0 \mu$ s  $\pm 10$  percent; prr = 1,500 minimum; grid pulse same as 7/. Tube shall operate for 20 minutes without continuous conduction.
- 14/ During every  $100 \pm 24$  hours of life-test operation, the life test shall be shut off for a minimum of 60 minutes, and then checked for life-test end points.
- 15/ Where production is less than 50 tubes per month, life test (1) will be performed alternately with life test (2) on a monthly basis. Sample size under these conditions shall total one tube per month.
- 16/ Tube must operate satisfactorily at the specified ambient temperature at operation (1) condition for a total of 5 consecutive hours with no more than three kickouts and with no evidence of detrimental anode heating. The tube shall be started with  $E_f = E_{res} = 6.8$  V ac and operate at this value for 4 hours. At the start of the fifth hour, and while the tube is still operating, the filament voltage shall be lowered to  $E_f = E_{res} = 5.8$  V ac and remain there for the final one hour of operation.
- 17/ This test shall be performed during the initial production and once each succeeding 12-calendar months in which there is production. An accept on zero defect sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2 with an acceptance level of 6.5 (see 18/). The "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.
- 18/ This specification sheet uses accept on zero defect sampling in accordance with MIL-PRF-1, table III.

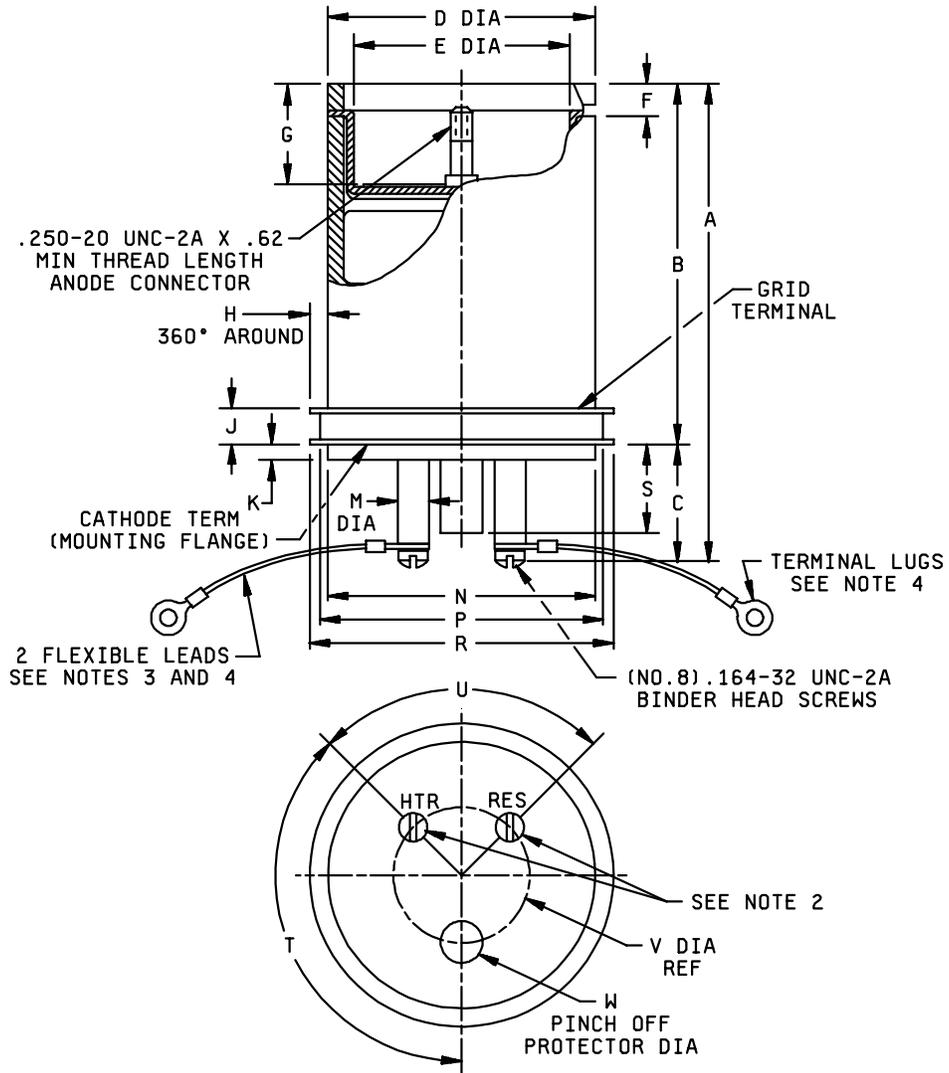


FIGURE 1. Outline drawing of electron tube type 7322.

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Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 1 (see note 1)				
K	.100	.180	2.54	4.57
N	2.985	3.015	75.82	76.58
Conformance inspection, part 2				
A	---	5.895	---	149.73
B	3.945	4.340	100.20	110.24
C	---	1.555	---	39.50
D	2.985	3.015	75.82	76.58
E	2.410	2.530	61.21	64.26
F	---	.313	---	7.95
G	.980	1.355	24.89	34.42
H	.093	---	2.36	---
J	.520	.570	13.21	14.48
M	---	.375	---	9.53
P	3.235	3.265	82.17	82.93
R	3.245	3.305	82.42	83.95
S	---	1.081	---	27.46
W	---	.469	---	11.91
Reference dimensions				
T	135°			
U	90°			
V	1.500		38.10	

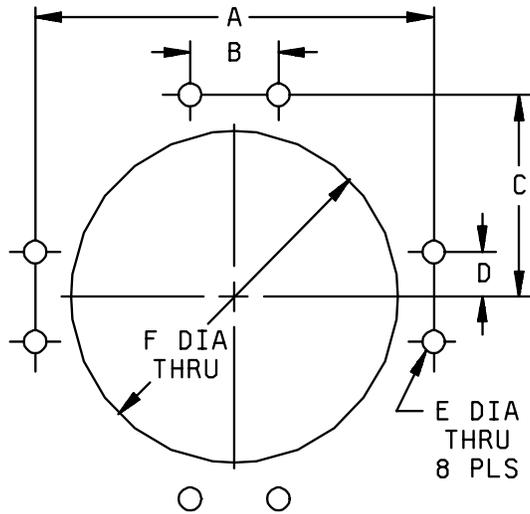
NOTES:

1. The acceptance level for dimensions listed under conformance inspection, part 1, shall be 1.0 (see 18/).
2. Reservoir and heater terminals shall be identified and marked on tube base as specified herein.
3. Insulated leads to be on 10.00 inch (254.0 mm) ± 1.00 inch (25.4 mm) centers.
4. Lead identification terminal lugs and insulation sleeving (in accordance with MIL-I-3190) shall be as follows. See note 5 for inspection procedures.

<u>Lead</u>	<u>Color</u>	<u>Sleeving</u>	<u>Terminal lugs clearance hole</u>
H = Heater	Yellow	H-A-I or H-B-I	.25 stud
R = Reservoir	Red	H-A-I or H-B-I	#10 stud

5. Dimensions shall be checked during the initial production and once each succeeding 12-calendar months in which there is production. An accept on zero defect sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, with an acceptance level of 6.5 (see 18/). The "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.

FIGURE 1. Outline drawing of electron tube type 7322 - Continued.



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	3.846	3.876	97.69	98.45
B	.844	.868	21.44	22.05
C	1.926	1.936	48.92	49.17
D	.423	.433	10.74	11.00
Reference Dimensions				
E	---	.219 DIA	---	5.56 DIA
F	---	3.062 DIA	---	77.77 DIA

FIGURE 2. Mounting hole dimensions.

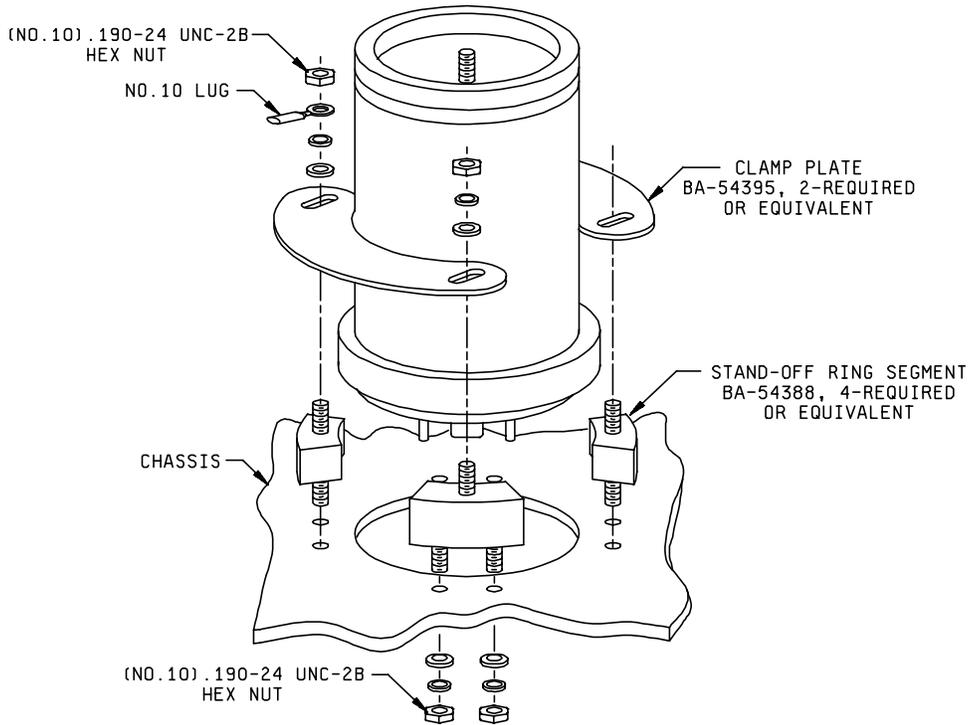


FIGURE 3. MT-4 tube mounting assembly.

NOTES

Referenced documents. In addition to MIL-PRF-1, this specification sheet sheet references MIL-STD-1311 and MIL-I-3190.

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

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