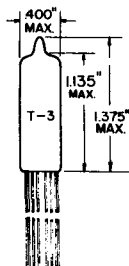


## TUNG-SOL

## DOUBLE TRIODE

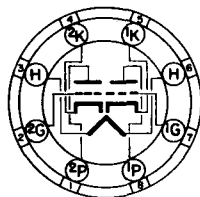
## SUBMINIATURE TYPE



GLASS BULB

## HEATER

ANY MOUNTING POSITION



BOTTOM VIEW

SUBMINIATURE BUTTON

8 PIN BASE

0.017" TINNED

FLEXIBLE LEADS

8DG

THE 6112WA IS A HEATER-CATHODE TYPE HIGH-MU DOUBLE TRIODE CAPABLE OF OPERATION IN THE UHF REGION. IT IS OF SUBMINIATURE CONSTRUCTION AND DESIGNED FOR SERVICE WHERE SEVERE CONDITIONS OF HIGH TEMPERATURE AND MECHANICAL SHOCK OR VIBRATION ARE ENCOUNTERED. THE FLEXIBLE LEADS MAY BE SOLDERED OR WELDED DIRECTLY TO THE TERMINALS OF CIRCUIT COMPONENTS WITHOUT THE USE OF SOCKETS. STANDARD SUBMINIATURE SOCKETS MAY BE USED BY CUTTING THE LEADS TO A SUITABLE LENGTH.

## RATINGS

## MECHANICAL

|                                                               |      |    |
|---------------------------------------------------------------|------|----|
| MAXIMUM IMPACT ACCELERATION (SHOCK TEST-NOTE 3)               | 450  | G  |
| MAXIMUM UNIFORM ACCELERATION (CENTRIFUGE TEST-NOTE 4)         | 1000 | G  |
| MAXIMUM VIBRATIONAL ACCELERATION (96 HR. FATIGUE TEST-NOTE 5) | 2.5  | G  |
| MAXIMUM BULB TEMPERATURE                                      | 220  | °C |

## RATINGS

## AND NORMAL OPERATION

|                               | MIL-E-1<br>SYMBOL  | DES.<br>MIN. | NORM.<br>TEST<br>CONDI-<br>TIONS<br>NOTE 7 | NORM.<br>OPER-<br>ATION<br>NOTE 6 | DES.<br>MAX. | MIL-E-1<br>UNITS |
|-------------------------------|--------------------|--------------|--------------------------------------------|-----------------------------------|--------------|------------------|
| HEATER VOLTAGE (NOTE 8)       | Ef:                | 6.0          | 6.3                                        | 6.3                               | 6.6          | V                |
| PLATE VOLTAGE                 | Eb:                | ---          | 100                                        | 100                               | 250          | Vdc              |
| PEAK PLATE VOLTAGE            | ep:                | ---          | ---                                        | ---                               | 360          | v                |
| GRID #1 VOLTAGE               | Ec1:               | -55          | 0                                          | 0                                 | ---          | Vdc              |
| PLATE DISSIPATION (PER PLATE) | Pp/p:              | ---          | ---                                        | 0.08                              | 0.3          | W                |
| GRID #1 CIRCUIT RESISTANCE    | Rg/g:              | ---          | ---                                        | 1.0                               | 1.1          | MEG.             |
| HEATER-CATHODE VOLTAGE        | Ehk:               | -200         | ---                                        | 100                               | +200         | Vdc              |
| PLATE CURRENT (PER PLATE)     | Ip/p:              | ---          | ---                                        | 0.8                               | 3.3          | mA <sub>dc</sub> |
| GRID CURRENT                  | Ic/c:              | ---          | ---                                        | ---                               | ---          | mA <sub>dc</sub> |
| CATHODE RESISTANCE (PER UNIT) | Rk:                | ---          | 1500                                       | 1500                              | ---          | OHMS             |
| TRANSCONDUCTANCE (PER PLATE)  | S <sub>m</sub> /p: | ---          | ---                                        | 1800                              | ---          | μMHOS            |
| AMPLIFICATION FACTOR          | M <sub>μ</sub> /p: | ---          | ---                                        | 70                                | ---          | ---              |

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## TUNG-SOL

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CHARACTERISTICS AND QUALITY CONTROL TESTS<sup>1</sup>

(IN THE FOLLOWING TESTS, EACH UNIT IS TESTED SEPARATELY)

| TEST                                                          | AQL<br>%                                            | MIL-E-1<br>SYMBOL                   | MIN  | LAL  | BOG  | UAL  | MAX  | ALD | MIL-E-1<br>UNITS |
|---------------------------------------------------------------|-----------------------------------------------------|-------------------------------------|------|------|------|------|------|-----|------------------|
| MEASUREMENTS ACCEPTANCE<br>TESTS - PART 1                     | COMBINED AQL=1.0% EXCLUDING MECH. AND INOPERATIVES. |                                     |      |      |      |      |      |     |                  |
| HEATER CURRENT:                                               | 0.4                                                 | I <sub>f</sub> :                    | 285  | ---  | ---  | ---  | 315  | --- | mA               |
| HEATER-CATHODE<br>LEAKAGE:                                    |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>hk</sub> =+100 Vdc                                     | 0.4                                                 | I <sub>hk</sub> :                   | ---  | ---  | ---  | ---  | 3.5  | --- | μAdc             |
| E <sub>hk</sub> =-100 Vdc                                     |                                                     | I <sub>hk</sub> :                   | ---  | ---  | ---  | ---  | 3.5  | --- | μAdc             |
| GRID CURRENT:                                                 |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>b</sub> =150 Vdc; E <sub>c</sub> =0;                   |                                                     |                                     |      |      |      |      |      |     |                  |
| R <sub>k</sub> =820 OHMS; R <sub>g</sub> =                    | 0.4                                                 | I <sub>c</sub> (1):                 | ---  | ---  | ---  | ---  | -0.3 | --- | μAdc             |
| 1.0 MEG.                                                      | 0.4                                                 | I <sub>b</sub> (1):                 | 0.50 | ---  | 0.8  | ---  | 1.10 | --- | mAdc             |
| PLATE CURRENT (1):                                            |                                                     |                                     |      |      |      |      |      |     |                  |
| PLATE CURRENT (2):                                            | 0.4                                                 | I <sub>b</sub> (2):                 | ---  | ---  | ---  | ---  | 50   | --- | μAdc             |
| E <sub>c</sub> 1=-2.8 Vdc                                     | 0.4                                                 | S <sub>m</sub> (1):                 | 1500 | 1650 | 1800 | 1950 | 2100 | 350 | μMHOS            |
| TRANSCONDUCTANCE (1):                                         |                                                     |                                     |      |      |      |      |      |     |                  |
| CONTINUITY AND SHORTS<br>(INOPERATIVES):                      | 0.4                                                 | ---                                 | ---  | ---  | ---  | ---  | ---  | --- | ---              |
| (NOTE 11)                                                     |                                                     |                                     |      |      |      |      |      |     |                  |
| MECHANICAL:                                                   |                                                     |                                     |      |      |      |      |      |     |                  |
| ENVELOPE (8-1)                                                | ---                                                 | ---                                 | ---  | ---  | ---  | ---  | ---  | --- | ---              |
| MEASUREMENTS ACCEPTANCE<br>TESTS - PART 2                     |                                                     |                                     |      |      |      |      |      |     |                  |
| INSULATION OF<br>ELECTRODES:                                  |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>f</sub> =6.3 V; E <sub>g</sub> -all=-100Vdc;           | 2.5                                                 | R <sub>g</sub> -all:                | 250  | ---  | ---  | ---  | ---  | --- | MEG.             |
| E <sub>p</sub> -all=-300 Vdc;                                 |                                                     | R <sub>p</sub> -all:                | 250  | ---  | ---  | ---  | ---  | --- | MEG.             |
| TRANSCONDUCTANCE (2):                                         |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>f</sub> =5.7 V; (NOTE 9)                               | 2.5                                                 | ΔE <sub>f</sub> S <sub>m</sub> (2): | ---  | ---  | ---  | ---  | 15   | --- | PERCENT          |
| GRID EMISSION:                                                |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>b</sub> =250 Vdc; R <sub>g</sub> =1.0                  |                                                     |                                     |      |      |      |      |      |     |                  |
| MEG; R <sub>k</sub> =2700 OHMS;                               |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>f</sub> =7.5 V; PREHEAT                                |                                                     |                                     |      |      |      |      |      |     |                  |
| AT E <sub>c</sub> =0; TEST AT                                 |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>c</sub> =-9.0 Vdc                                      | 6.5                                                 | I <sub>c</sub> (2):                 | ---  | ---  | ---  | ---  | -0.5 | --- | μAdc             |
| AF NOISE:                                                     |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>sig</sub> =45mVac; R <sub>g</sub> =                    |                                                     |                                     |      |      |      |      |      |     |                  |
| 0.5 MEG.; R <sub>p</sub> =0.2 MEG ;                           |                                                     |                                     |      |      |      |      |      |     |                  |
| R <sub>k</sub> =750 OHMS; C <sub>k</sub> =                    |                                                     |                                     |      |      |      |      |      |     |                  |
| 1000 μf; UNITS CON-                                           | 2.5                                                 | EB:                                 | ---  | ---  | ---  | ---  | 17   | --- | VU               |
| NECTED IN PARALLEL                                            |                                                     |                                     |      |      |      |      |      |     |                  |
| AMPLIFICATION FACTOR:                                         | 6.5                                                 | Mu:                                 | 60   | ---  | 70   | ---  | 80   | --- | ---              |
| AC AMPLIFICATION:                                             |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>sig</sub> =0.2 Vac; E <sub>bb</sub> =100               |                                                     |                                     |      |      |      |      |      |     |                  |
| Vdc; E <sub>cc</sub> =0; R <sub>k</sub> =0; R <sub>g</sub> 1= |                                                     |                                     |      |      |      |      |      |     |                  |
| 10 MEG.;                                                      | 6.5                                                 | E <sub>p</sub> :                    | 8.0  | ---  | ---  | ---  | ---  | --- | Vac              |
| HEATER-CATHODE<br>LEAKAGE (2):                                |                                                     |                                     |      |      |      |      |      |     |                  |
| E <sub>f</sub> =-6.7V; PIN 6 NEGA-                            |                                                     |                                     |      |      |      |      |      |     |                  |
| TIVE; E <sub>hk</sub> =+100 Vdc;                              |                                                     |                                     |      |      |      |      |      |     |                  |
| CATHODE NEGATIVE t=                                           |                                                     |                                     |      |      |      |      |      |     |                  |
| 16 SEC.; (NOTE 12)                                            | 6.5                                                 | I <sub>hk</sub> (2):                | ---  | ---  | ---  | ---  | 1.0  | --- | μAdc             |

## TUNG-SOL

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### CHARACTERISTICS AND QUALITY CONTROL TESTS<sup>1</sup>

(IN THE FOLLOWING TESTS, EACH UNIT IS TESTED SEPARATELY)

| TEST                                                                                                     | AQL<br>%     | MIL-E-1<br>SYMBOL | MIN      | LAL               | BOG  | UAL  | MAX              | ALD | MIL-E-1<br>UNITS |
|----------------------------------------------------------------------------------------------------------|--------------|-------------------|----------|-------------------|------|------|------------------|-----|------------------|
| MEASUREMENTS ACCEPTANCE                                                                                  |              |                   |          |                   |      |      |                  |     |                  |
| TESTS PART 2 (CONT'D.)                                                                                   |              |                   |          |                   |      |      |                  |     |                  |
| COMBINED AQL=1.0% EXCLUDING MECH. AND INOPERATIVES                                                       |              |                   |          |                   |      |      |                  |     |                  |
| CAPACITANCE:                                                                                             |              | Cgp:              | 0.8      | ---               | 1.00 | ---  | 1.20             | --- | $\mu\text{f}$    |
| CAPACITANCE:                                                                                             |              | Cin:              | 1.30     | ---               | 1.70 | ---  | 2.10             | --- | $\mu\text{f}$    |
| CAPACITANCE: (NOTE 2)                                                                                    | 6.5          | Cout:             | 0.16     | ---               | 0.23 | ---  | 0.30             | --- | $\mu\text{f}$    |
|                                                                                                          |              | UNIT #1           |          |                   |      |      |                  |     |                  |
| CAPACITANCE:                                                                                             |              | Cout              | 0.21     | ---               | 0.28 | ---  | 0.35             | --- | $\mu\text{f}$    |
|                                                                                                          |              | UNIT #2:          |          |                   |      |      |                  |     |                  |
| CAPACITANCE:                                                                                             |              | Cgg:              | ---      | ---               | ---  | ---  | 0.014            | --- | $\mu\text{f}$    |
| CAPACITANCE:                                                                                             |              | Cpp:              | ---      | ---               | ---  | ---  | 0.80             | --- | $\mu\text{f}$    |
| LOW PRESSURE                                                                                             |              |                   |          |                   |      |      |                  |     |                  |
| BREAKDOWN:                                                                                               |              |                   |          |                   |      |      |                  |     |                  |
| PRESSURE=21 $\pm$ 3mmHG;<br>VOLTAGE=300 Vac                                                              | 6.5          |                   |          |                   |      |      |                  |     |                  |
| VIBRATION (2):                                                                                           |              |                   |          |                   |      |      |                  |     |                  |
| F=40 cps; G=15; Rp=10,000 OHMS                                                                           | 2.5          | Ep:               | ---      | ---               | ---  | ---  | 20               | --- | mVac             |
| VIBRATION (3):                                                                                           |              |                   |          |                   |      |      |                  |     |                  |
| F=70-2000; t=3 MINUTES;<br>G=15; Rp=10,000 OHMS;<br>POSITIONS X AND X 2 ONLY.                            | 6.5          | ep:               | ---      | ---               | ---  | ---  | 75               | --- | mv               |
|                                                                                                          |              |                   |          |                   |      |      | peak to peak     |     |                  |
| OPERATION TIME:<br>(NOTE 10)                                                                             | 4.0          | t:                | ---      | ---               | ---  | ---  | 20               | --- | sec.             |
| ALLOWABLE DEF. PER CHARACTER.                                                                            |              |                   |          |                   |      |      |                  |     |                  |
| TEST                                                                                                     | 1st<br>SAMP. | COMB.<br>SAMP.    | AQL<br>% | MIL-E-1<br>SYMBOL | MIN. | MAX. | MIL-E-1<br>UNITS |     |                  |
| DEGRADATION RATE                                                                                         |              |                   |          |                   |      |      |                  |     |                  |
| ACCEPTANCE TESTS                                                                                         |              |                   |          |                   |      |      |                  |     |                  |
| SUBMINIATURE                                                                                             |              |                   |          |                   |      |      |                  |     |                  |
| LEAD FATIGUE:                                                                                            | ---          | ---               | 2.5      | ---               | 4.0  | ---  | arcs             |     |                  |
| SHOCK (1):                                                                                               |              |                   |          |                   |      |      |                  |     |                  |
| Ehk=+100 Vdc; Rg=0.1 MEG.; HAMMER<br>ANGLE = 30°; (NOTE 3)                                               | ---          | ---               | 20       | ---               | ---  | ---  | ---              |     |                  |
| FATIGUE (1):                                                                                             |              |                   |          |                   |      |      |                  |     |                  |
| 96 HOURS; G=2.5;<br>FIXED FREQUENCY;<br>F=25 MIN; 60 MAX.;                                               |              |                   |          |                   |      |      |                  |     |                  |
| (NOTE 5)                                                                                                 | ---          | ---               | 6.5      | ---               | ---  | ---  | ---              |     |                  |
| SHOCK (2):                                                                                               |              |                   |          |                   |      |      |                  |     |                  |
| Ehk=+100 Vdc; Rg=0.1 MEG.; HAMMER<br>ANGLE = 120 °+<br>RUB BER PAD; t=10<br>MILLISECONDS; G=75 (NOTE 14) | ---          | ---               | 20       | ---               | ---  | ---  | ---              |     |                  |
| FATIGUE (2):                                                                                             |              |                   |          |                   |      |      |                  |     |                  |
| 6 HOURS; G=10; F=130-2000-130 cps (NOTE 13)                                                              | ---          | ---               | 6.5      | ---               | ---  | ---  | ---              |     |                  |

## TUNG-SOL

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CHARACTERISTICS AND QUALITY CONTROL TESTS<sup>1</sup> cont'd.

| TEST:                                                                 | ALLOWABLE DEF.<br>PER CHARACT. |                | AQL  | MIL-E-1<br>SYMBOL   | MIN  | MAX. | MIL-E-1<br>UNITS |
|-----------------------------------------------------------------------|--------------------------------|----------------|------|---------------------|------|------|------------------|
|                                                                       | 1st<br>SAMP.                   | COMB.<br>SAMP. |      |                     |      |      |                  |
| DEGRADATION RATE                                                      |                                |                |      |                     |      |      |                  |
| ACCEPTANCE TESTS -CONT'D.                                             |                                |                |      |                     |      |      |                  |
| POST SHOCK AND FATIGUE<br>(1) AND (2) TEST END<br>POINTS:             |                                |                |      |                     |      |      |                  |
| VIBRATION (2):<br>F=40 cps; G=15; Rp=<br>10,000 OHMS.                 | ---                            | ---            | ---  | Ep:                 | 80   | ---  | mVac             |
| HEATER-CATHODE                                                        |                                |                |      |                     |      |      |                  |
| LEAKAGE:                                                              |                                |                |      |                     |      |      |                  |
| Ehk=+100 Vdc                                                          | ---                            | ---            | ---  | Ihk(1):             | ---  | 7    | $\mu$ Adc        |
| Ehk=-100 Vdc                                                          | ---                            | ---            | ---  | Ihk(1):             | ---  | 7    | $\mu$ Adc        |
| CHANGE IN TRANS-<br>CONDUCTANCE (1) OF<br>INDIVIDUAL TUBES:           |                                |                |      |                     |      |      |                  |
| Ef=6.3 V                                                              | ---                            | ---            | ---  | $\Delta S_m(1):$    | ---  | 15   | PERCENT          |
| GRID CURRENT (1):                                                     | ---                            | ---            | ---  | I <sub>g</sub> (1): | ---  | -1.0 | $\mu$ Adc        |
| GLASS STRAIN<br>(THERMAL SHOCK):                                      | ---                            | ---            | 6.5  | ---                 | ---  | ---  | ---              |
| ACCEPTANCE LIFE TESTS                                                 |                                |                |      |                     |      |      |                  |
| HEATER CYCLING:                                                       |                                |                |      |                     |      |      |                  |
| Ef=7.0V; Eb=Ec=0V;<br>Ehk=140 Vac; 1 MIN.<br>ON, 4 MIN. OFF           | ---                            | ---            | 1.0  | ---                 | 2000 | ---  | CYCLES           |
| HEATER CYCLING LIFE<br>TEST END POINTS:                               |                                |                |      |                     |      |      |                  |
| HEATER-CATHODE<br>LEAKAGE:                                            |                                |                |      |                     |      |      |                  |
| Ehk=+100 Vdc                                                          | ---                            | ---            | ---  | Ihk(1):             | ---  | 10   | $\mu$ Adc        |
| Ehk=-100 Vdc                                                          | ---                            | ---            | ---  | Ihk(1):             | ---  | 10   | $\mu$ Adc        |
| 2 & 20 HOUR STABILITY<br>LIFE TEST:                                   |                                |                |      |                     |      |      |                  |
| TA=ROOM; Ehk=+200 Vdc;<br>Rg/g=1.0 MEG.; Eb=150<br>Vdc; Rk/k=820 OHMS | ---                            | ---            | ---  | ---                 | ---  | ---  | ---              |
| 2 & 20 HOUR STABILITY<br>LIFE TEST END POINTS:                        |                                |                |      |                     |      |      |                  |
| CHANGE IN TRANSCON-<br>DUCTANCE (1) OF IN-<br>DIVIDUAL TUBES:         |                                |                |      |                     |      |      |                  |
| (TYPICAL SAMPLE SIZE=<br>50 TUBES)                                    | ---                            | ---            | 1.0  | $\Delta S_m(1):$    | ---  | 10   | PERCENT          |
| 100 HOUR SURVIVAL<br>RATE LIFE TEST:                                  |                                |                |      |                     |      |      |                  |
| TA=ROOM; Ehk=+200 Vdc;<br>Rg/g=1.0 MEG.; Eb=150 Vdc;<br>Rk/k=820 OHMS | ---                            | ---            | ---  | ---                 | ---  | ---  | ---              |
| 100 HOUR SURVIVAL RATE<br>LIFE TEST END POINTS:                       |                                |                |      |                     |      |      |                  |
| TYPICAL SAMPLE SIZE=<br>200 TUBES)                                    | ---                            | ---            | ---  | ---                 | ---  | ---  | ---              |
| CONTINUITY AND SHORTS<br>(INOPERATIVES):                              | ---                            | ---            | 0.65 | ---                 | ---  | ---  | ---              |
| TRANSCONDUCTANCE (1):                                                 | ---                            | ---            | 1.0  | S <sub>m</sub> (1): | 1200 | ---  | $\mu$ MHOS       |

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## TUNG-SOL

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CHARACTERISTICS AND QUALITY CONTROL TESTS<sup>1</sup> cont'd.

| TEST                                                    | ALLOWABLE DEF.<br>PER CHARACTER. |                | AQL<br>% | MIL-E-1<br>SYMBOL     | MIN. | MAX. | MIL-E-1<br>UNITS |
|---------------------------------------------------------|----------------------------------|----------------|----------|-----------------------|------|------|------------------|
|                                                         | 1st<br>SAMP.                     | COMB.<br>SAMP. |          |                       |      |      |                  |
| ACCEPTANCE LIFE<br>TESTS (CONT'D.)                      |                                  |                |          |                       |      |      |                  |
| 200 HOUR INTERMITTENT<br>LIFE TEST (1):                 |                                  |                |          |                       |      |      |                  |
| TA=ROOM; Eb=250 Vdc;                                    |                                  |                |          |                       |      |      |                  |
| Ehk=+200 Vdc; Rg/g=                                     |                                  |                |          |                       |      |      |                  |
| 1.0 MEG.; Rk/k=2700 OHMS                                |                                  |                |          |                       |      |      |                  |
| 200 HOUR INTERMITTENT<br>LIFE TEST (1) END POINTS:      |                                  |                |          |                       |      |      |                  |
| (TYPICAL SAMPLE SIZE=                                   |                                  |                |          |                       |      |      |                  |
| 20 TUBES 1st SAMPLE; 40                                 |                                  |                |          |                       |      |      |                  |
| TUBES 2nd SAMPLE)                                       |                                  |                |          |                       |      |      |                  |
| INOPERATIVES:                                           | 1                                | 3              | ---      | ---                   | ---  | ---  | ---              |
| GRID CURRENT (1):                                       | 1                                | 3              | ---      | lc1:                  | ---  | -0.9 | $\mu$ Adc        |
| HEATER CURRENT:                                         | 1                                | 3              | ---      | lf:                   | 276  | 328  | mA               |
| CHANGE IN TRANSCON-                                     |                                  |                |          |                       |      |      |                  |
| DUCTANCE OF INDIVI-                                     |                                  |                |          |                       |      |      |                  |
| DUAL TUBES:                                             | 1                                | 3              | ---      | $\Delta_t Sm(1)$ :    | ---  | 25   | PERCENT          |
| TRANSCONDUCTANCE (2):                                   | 1                                | 3              | ---      | $\Delta_{Et} Sm(2)$ : | ---  | 20   | PERCENT          |
| HEATER-CATHODE<br>LEAKAGE (1):                          |                                  |                |          |                       |      |      |                  |
| Ehk=+100 Vdc                                            | 1                                | 3              | ---      | lhk(1):               | ---  | 10   | $\mu$ Adc        |
| Ehk=-100 Vdc                                            |                                  |                | ---      | lhk(1):               | ---  | 10   | $\mu$ Adc        |
| INSULATION OF<br>ELECTRODES:                            |                                  |                |          |                       |      |      |                  |
| g-all:                                                  | 1                                | 3              | ---      | Rg-all:               | 100  | ---  | MEG.             |
| p-all:                                                  |                                  |                | ---      | Rp-all:               | 100  | ---  | MEG.             |
| TOTAL DEFECTIVES:                                       | 3                                | 6              | ---      | ---                   | ---  | ---  | ---              |
| HOUR INTERMITTENT HIGH<br>TEMPERATURE LIFE TEST (2):    |                                  |                |          |                       |      |      |                  |
| T BULB=220°C; Ehk=200                                   |                                  |                |          |                       |      |      |                  |
| Vdc; Rg/g=1.0 MEG.; Eb=150                              |                                  |                |          |                       |      |      |                  |
| Vdc; Rk/k=820 OHMS                                      | ---                              | ---            | ---      | ---                   | ---  | ---  | ---              |
| 500 HOUR INTERMITTENT HIGH<br>TEMPERATURE LIFE TEST (2) |                                  |                |          |                       |      |      |                  |
| END POINTS:                                             |                                  |                |          |                       |      |      |                  |
| (TYPICAL SAMPLE SIZE=                                   |                                  |                |          |                       |      |      |                  |
| 20 TUBES 1st SAMPLE, 40                                 |                                  |                |          |                       |      |      |                  |
| TUBES 2nd SAMPLE)                                       | ---                              | ---            | ---      | ---                   | ---  | ---  | ---              |
| INOPERATIVES:                                           | 1                                | 3              | ---      | ---                   | ---  | ---  | ---              |
| GRID CURRENT (1):                                       | 1                                | 3              | ---      | lc(1):                | ---  | -0.7 | $\mu$ Adc        |
| HEATER CURRENT:                                         | 1                                | 3              | ---      | lf:                   | 276  | 328  | mA               |
| TRANSCONDUCTANCE (1)                                    |                                  |                |          |                       |      |      |                  |
| CHANGE OF INDIVIDUAL                                    |                                  |                |          |                       |      |      |                  |
| TUBES FROM INITIAL:                                     | 1                                | 3              | ---      | $\Delta_t Sm(1)$ :    | ---  | 20   | PERCENT          |
| TRANSCONDUCTANCE (2):                                   |                                  |                |          |                       |      |      |                  |
| (NOTE 9)                                                | 1                                | 3              | ---      | $\Delta_{Et} Sm(2)$ : | ---  | 15   | PERCENT          |
| HEATER-CATHODE<br>LEAKAGE (1):                          |                                  |                |          |                       |      |      |                  |
| Ehk=+100 Vdc                                            | 1                                | 3              | ---      | lhk(1):               | ---  | 10   | $\mu$ Adc        |
| Ehk=-100 Vdc                                            |                                  |                | ---      | lhk(1):               | ---  | 10   | $\mu$ Adc        |

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CHARACTERISTICS AND QUALITY CONTROL TESTS<sup>1</sup> - cont'd.

| TEST                                                                   | ALLOWABLE DEF.<br>PER CHARACTER. |                | AQL<br>% | MIL-E-1<br>SYMBOL           | MIN. | MAX. | MIL-E-1<br>UNITS |
|------------------------------------------------------------------------|----------------------------------|----------------|----------|-----------------------------|------|------|------------------|
|                                                                        | 1st<br>SAMP.                     | COMB.<br>SAMP. |          |                             |      |      |                  |
| ACCEPTANCE LIFE TESTS<br>(CONT'D.)                                     |                                  |                |          |                             |      |      |                  |
| INSULATION OF<br>ELECTRODES:                                           |                                  |                |          |                             |      |      |                  |
| g-all:                                                                 | 1                                | 3              | ---      | Rg-all:                     | 50   | ---  | MEG.             |
| p-all:                                                                 |                                  |                | ---      | Rp-all:                     | 50   | ---  | MEG.             |
| TRANSCONDUCTANCE (1)                                                   |                                  |                |          |                             |      |      |                  |
| AVERAGE CHANGE:                                                        | 1                                | 3              | ---      | Avg.<br>$\Delta_t S_m(1)$ : | ---  | 15   | PERCENT          |
| TOTAL DEFECTIVES:                                                      | 3                                | 6              | ---      | ---                         | ---  | ---  | ---              |
| 1000 HOUR HIGH TEMPERATURE<br>LIFE TEST (2) END POINTS:                |                                  |                |          |                             |      |      |                  |
| (TYPICAL SAMPLE SIZE =<br>20 TUBES 1st SAMPLE;<br>40 TUBES 2nd SAMPLE) | ---                              | ---            | ---      | ---                         | ---  | ---  | ---              |
| INOPERATIVES:                                                          | 1                                | 3              | ---      | ---                         | ---  | ---  | ---              |
| GRID CURRENT (1):                                                      | 1                                | 3              | ---      | Ic1:                        | ---  | -1.0 | $\mu$ Adc        |
| HEATER CURRENT:                                                        | 1                                | 3              | ---      | If:                         | 276  | 328  | mA               |
| TRANSCONDUCTANCE (1)                                                   |                                  |                |          |                             |      |      |                  |
| CHANGE OF INDIVIDUAL<br>TUBES FROM INITIAL:                            | 1                                | 3              | ---      | $\Delta_t S_m(1)$ :         | ---  | 25   | PERCENT          |
| TRANSCONDUCTANCE (2):<br>(NOTE 9)                                      | 1                                | 3              | ---      | $\Delta_{Et} S_m(2)$ :      | ---  | 20   | PERCENT          |
| HEATER-CATHODE<br>LEAKAGE (1):                                         |                                  |                |          |                             |      |      |                  |
| Ehk(1) $\approx$ +100 Vdc                                              | 1                                | 3              | ---      | Ihk(1):                     | ---  | 10   | $\mu$ Adc        |
| Ehk(1) $\approx$ +100 Vdc                                              |                                  |                | ---      | Ihk(1):                     | ---  | 10   | $\mu$ Adc        |
| INSULATION OF ELECTRODES:                                              |                                  |                |          |                             |      |      |                  |
| g1-all:                                                                | 2                                | 5              | ---      | Rg-all:                     | 25   | ---  | MEG.             |
| p-all:                                                                 |                                  |                | ---      | Rp-all:                     | 25   | ---  | MEG.             |
| TOTAL DEFECTIVES:                                                      | 4                                | 8              | ---      | ---                         | ---  | ---  | ---              |

## NOTES:

- CHARACTERISTICS, QUALITY CONTROL TEST PROCEDURES, AND INSPECTION LEVELS ARE MADE ACCORDING TO THE APPROPRIATE PARAGRAPH OF MIL-E-1, "INSPECTION INSTRUCTIONS FOR ELECTRON TUBES", AND MIL-STD-105A.
- WITHOUT SHIELD.
- TEST CONDITIONS AND ACCEPTANCE CRITERIA PER SHOCK TEST PROCEDURES OF MIL-E-1 BASIC SPECIFICATIONS.
- CENTRIFUGE TEST WITH FORCES APPLIED IN ANY DIRECTION.
- TEST CONDITIONS AND ACCEPTANCE CRITERIA PER FATIGUE TEST PROCEDURES OF MIL-E-1 BASIC SPECIFICATIONS.
- THESE NORMAL VALUES REPRESENT CONDITIONS AT WHICH CONTROL OF RELIABILITY MAY BE EXPECTED.

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## NOTES - CONT'D.

- 7 THESE NORMAL TEST CONDITIONS ARE USED FOR ALL CHARACTERISTIC TESTS UNLESS OTHERWISE STATED UNDER THE INDIVIDUAL TEST ITEM.
- 8 FOR MOST APPLICATIONS THE PERFORMANCE WILL NOT BE ADVERSELY AFFECTED BY  $\pm 5\%$  HEATER VOLTAGE VARIATION, BUT WHEN THE APPLICATION CAN PROVIDE A CLOSER CONTROL OF HEATER VOLTAGE, AN IMPROVEMENT IN RELIABILITY WILL BE REALIZED.
- 9 CHANGE OF TRANSCONDUCTANCE FOR INDIVIDUAL TUBES FROM THAT VALUE MEASURED AT  $E_f = 6.3$  V TO THAT VALUE MEASURED AT  $E_f = 5.7$  V.
10. OPERATION TIME IS THE TIME IN SECONDS REQUIRED FOR THE PLATE CURRENT TO ATTAIN A VALUE WITHIN  $\pm 10\%$  OF THE THREE (3) MINUTE PLATE CURRENT (1) VALUE MEASURED AT PLATE CURRENT (1) TEST CONDITIONS. NO PREHEATING BEFORE THIS TEST IS ALLOWED, A COLD TUBE MUST BE USED.
11. DURING BOTH CONTINUITY AND SHORT TESTING, THE TUBE UNDER TEST SHALL BE TAPPED AT LEAST THREE TIMES IN EACH OF TWO PLANES  $90^\circ$  APART WITH A TAPPER WHICH SHALL BE ADJUSTED TO GIVE AN IMPULSE OF APPROXIMATELY ONE HALF SINE WAVE OF  $300 \pm 50$  MICRO SECONDS DURATION AND HAVING A MINIMUM AVERAGE AMPLITUDE OF 80 G'S PEAK ACCELERATION AS MEASURED WITH A GULTON A-305 ACCELEROMETER AND KA-1 KIT. THE SHORTS DETECTING EQUIPMENT SHALL BE A DEVICE CAPABLE OF DETECTING AS SHORTS, THE FOLLOWING INTERELEMENT RESISTANCES OF THE GIVEN TIME DURATION.

| DURATION          | SENSITIVITY  |
|-------------------|--------------|
| PERMANENT SHORT   | 600,000 OHMS |
| 500 MICRO SECONDS | 500,000 OHMS |
| 100 MICRO SECONDS | 100,000 OHMS |
| 60 MICRO SECONDS  | 1,000 OHMS   |

TUBES WHICH GIVE AN INDICATION OF ONE OR MORE OF THE FOLLOWING SHALL BE REJECTED AS INOPERABLE:

- A. EITHER A PERMANENT OR TAP SHORT AT ANY TIME DURING THE TAPPING PROCEDURE
  - B. ANY OPEN CIRCUIT
  - C. AIR LEAKS
12. HEATER-CATHODE LEAKAGE (2) SHALL BE PERFORMED AS FOLLOWS:
    - A. PREHEAT TUBES FOR 10 SECONDS WITH  $E_f = 10.5$  V
    - B. TEST IMMEDIATELY BY THE APPLICATION OF THE SPECIFIED TEST CONDITIONS FOR THIS TEST
    - C. AFTER 16 SECONDS READ HEATER-CATHODE LEAKAGE OF EACH SECTION.
  13. THE TUBES SHALL BE RIGIDLY MOUNTED ON A TABLE VIBRATING WITH SIMPLE HARMONIC MOTION. THE TUBES SHALL BE VIBRATED FOR A TOTAL OF 6 HOURS, 2 HOURS IN EACH OF THREE POSITIONS, X1, X2, AND Y1. ONLY RATED HEATER VOLTAGE SHALL BE APPLIED. TUBES WHICH SHOW ONE OR MORE OF THE FOLLOWING DEFECTS SHALL BE CONSIDERED FAILURES.
    - A. TUBES WHICH SHOW PERMANENT OR TAP SHORTS OR OPEN CIRCUITS FOLLOWING FATIGUE TEST, WHEN TESTED AS SPECIFIED IN 4.7.2 AND 4.7.3
    - B. TUBES WHICH DO NOT COMPLY WITH POST FATIGUE LIMITS, THIS IS A DESTRUCTIVE TEST
  14. THE PROVISIONS OF PARAGRAPH 4.9.20.5 OF SPECIFICATION MIL-E-1 SHALL APPLY, EXCEPT FOR EXCEPT FOR TEST CONDITIONS LISTED FOR SHOCK TEST (2).

