# TUNG-SOL

# PRODUCT BULLETIN

# INDUSTRIAL ELECTRON TUBE TYPE 7890

SEPTEMBER, 1963

## CERAMIC HYDROGEN THYRATRON

**DESCRIPTION** — The 7890 is a ceramic, four element, hydrogen filled, zero bias thyratron designed for the generation of very high power pulses. The primary application for this tube is in high-power radar modulators in which it is capable of a peak power of 48 megawatts at an average power of 46 kilowatts. The tube is capable of handling a maximum average power of 80 kilowatts. The gradient grid makes it possible to obtain a more effective d-c holdoff at the maximum forward voltage rating than is possible in a conventional thyratron.

The external anode and forced air or liquid cooling of the 7890 provide high heat dissipation in a size considerably smaller than that of similar tubes of lower electrical ratings. An externally connected reservoir promotes stable operation and long life by maintaining a constant hydrogen density.

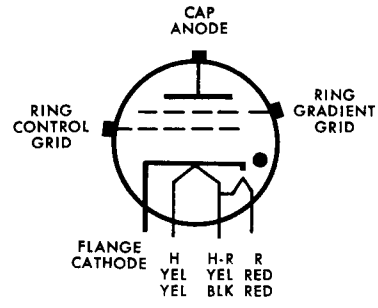

**See Page 2 For Outline Drawing**

### ELECTRICAL DATA

| | Min | Bogey | Max | |
|---|---|---|---|---|
| Heater Voltage | 6.0 | 6.3 | 6.6 | Volts |
| Heater Current — $E_f$ = 6.3 Volts | 20 | — | 40 | Amperes |
| Reservoir Voltage | 2.5 | — | 5.5 | Volts |
| Reservoir Current — $E_{res}$ = 3.5 Volts | 8 | — | 12 | Amperes |
| Cathode and Reservoir Heating Time | 5 | — | — | Minutes |
| Tube Voltage Drop | — | — | 400 | Volts |
| Anode Delay Time | — | — | 0.5 | Microsecond |
| Time Jitter — Note 1 | — | — | 5 | Nanoseconds |

### RATINGS — ABSOLUTE VALUES

| | Min | Max | |
|---|---|---|---|
| Anode Voltage — Peak | | | |
| Forward | — | 40,000 | Volts |
| Inverse — Note 2 | — | 40,000 | Volts |
| Cathode Current | | | |
| Peak | — | 2,400 | Amperes |
| Average | — | 2.6 | Amperes |
| RMS | — | 75 | Amperes |
| D-C Anode Voltage | 3,500 | — | Volts |
| Control Grid Voltage — Note 3 | — | — | |
| Peak Forward | 1,300 | 2,500 | Volts |
| Peak Inverse | — | −650 | |
| Gradient Grid Voltage — Note 4 | — | — | |
| Heating Factor — Pb = epy x ib x prr — Note 5 | — | $55 \times 10^9$ | |
| Current Rate of Rise | — | 10,000 | Amperes per microsecond |
| Ambient Temperature — Note 6 | −55 | +75 | Degrees Centigrade |




**BASING DIAGRAM**
**BOTTOM VIEW**

NOTES:

1. The time jitter limit as stated is the maximum allowable variation in firing time measured at 50 percent of pulse amplitude after the tube has been operating for at least 60 seconds. To obtain the lowest possible jitter, the tube should be operated above 15 kilovolts with maximum grid trigger voltage, maximum rate of rise of cathode pulse, and minimum value of driver circuit impedance.
2. In pulsed operation, the peak inverse voltage, exclusive of a 0.05 microsecond maximum duration spike, shall not exceed 10 kilovolts during the first 25 microseconds after the pulse.
3. The driver pulse is measured at the tube socket with the tube out of socket. Time of rise equals 0.35 microseconds maximum, pulse duration equals 2.0 microseconds minimum, and driver circuit impedance to be from 10 to 25 ohms.
4. Greatest stability of operation will be achieved by connecting the gradient grid to the midpoint of a resistance divider, consisting of two 20 megohm resistors in series, connected between anode and cathode, or ground.
5. For operation at Pb = 30 x $10^9$ or lower, convection cooling is adequate. Operation above Pb = 30 x $10^9$ requires cooling of the anode. The product of gallons of liquid per minute and temperature rise in degrees Centigrade shall not exceed five. Minimum liquid flow shall be one gallon per minute. For forced air cooling, a minimum of 6 cfm at an inlet temperature of not over 40 degrees Centigrade is required.
6. When water cooling is employed, the tube is rated for operation up to an ambient temperature of +90 degrees Centigrade provided that the water temperature at the input of the anode cooling coil does not exceed +75 degrees Centigrade.