

**15D12**  
**RADIATION COOLED TRIODE**  
 Directly heated

**GENERAL**

The 15D12 is a directly heated radiation cooled triode. It has a graphite anode, a thoriated tungsten filament and is intended for use in r.f. heating equipment.

**RATING**

|                              |                 |        |      |
|------------------------------|-----------------|--------|------|
| Filament Voltage             | $V_f$           | 6.3    | V    |
| Filament Current             | $I_f$           | 31—34* | A    |
| Maximum Peak Anode Voltage   | $V_a(pk)_{max}$ | 6.0    | kV   |
| Maximum Anode Dissipation    | $P_a(max)$      | 800**  | W    |
| Maximum Grid Dissipation     | $P_g(max)$      | 60     | W    |
| Maximum Peak Cathode Current | $i_k(pk)_{max}$ | 4.0    | A    |
| Maximum Operating Frequency  | $f_{max}$       | 60     | Mc/s |
| Maximum Seal Temperature     | $T_{seal(max)}$ | 200    | °C   |
| Maximum Bulb Temperature     | $T_{bulb(max)}$ | 250    | °C   |

\* The filament is suitable for direct switching without additional current limitations and will withstand fluctuations in voltage of  $\pm 5\%$ .

\*\* At this dissipation the anode runs at approximately 900°C (Optical reading)

All limiting values are Absolute, not Design Centres.

**INTER-ELECTRODE CAPACITANCES**

|                |           |     |    |
|----------------|-----------|-----|----|
| Anode/Grid     | $C_{a-g}$ | 6.5 | pF |
| Grid/Filament  | $C_{g-f}$ | 13  | pF |
| Anode/Filament | $C_{a-f}$ | 0.5 | pF |

**CHARACTERISTICS**

|                                                |       |     |            |
|------------------------------------------------|-------|-----|------------|
| Anode Voltage                                  | $V_a$ | 4.0 | kV         |
| Anode Current                                  | $I_a$ | 200 | mA         |
| Mutual Conductance                             | $g_m$ | 5.6 | mA/V       |
| Amplification Factor                           | $\mu$ | 23  |            |
| Anode Resistance ( $\delta V_a / \delta I_a$ ) | $r_a$ | 4.1 | k $\Omega$ |

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**TYPICAL OPERATION**—At maximum operating conditions per valve.

Class B1 audio amplification—push pull operation.

|                             |                      |      |    |
|-----------------------------|----------------------|------|----|
| Anode Voltage               | $V_a$                | 6.0  | kV |
| A.C. Anode Current (r.m.s.) | $I_a(\text{r.m.s.})$ | 0.4  | A  |
| Power Input                 | $P_{in}$             | 1.5  | kW |
| Power Output                | $P_{out}$            | 0.7  | kW |
| Anode Dissipation           | $p_a$                | 0.8  | kW |
| Anode Efficiency            |                      | 48   | %  |
| Bias Voltage                | $V_g$                | -225 | V  |
| Peak Signal Voltage         | $v_{sig}(\text{pk})$ | 225  | V  |

**TYPICAL OPERATION**—At maximum operating conditions.

Class C self oscillator—single phase full wave rectified (no smoothing)

|                             |           | Mean | R.M.S. | Peak |            |
|-----------------------------|-----------|------|--------|------|------------|
| Anode Voltage               | $V_a$     | 3.8  | 4.25   | 6.0  | kV         |
| Bias Voltage                | $V_g$     | -150 |        |      | V          |
| Positive Grid Voltage       | $V_{sig}$ | 180  |        |      | V          |
| Grid Resistor               |           | 1.05 |        |      | k $\Omega$ |
| Anode Current               | $I_a$     | 625  |        | 1700 | mA         |
| Grid Current                | $I_g$     | 140  |        | 800  | mA         |
| Cathode Current             | $I_k$     | 2.55 | 2.8    | 4.0  | A          |
| Anode Dissipation           | $p_a$     | 800  |        |      | W          |
| Grid Drive Power            |           | 55   |        |      | W          |
| Grid Dissipation            | $p_g$     | 25   |        |      | W          |
| Anode Efficiency            |           | 72   |        |      | %          |
| Power Output (amplifier)    | $P_{out}$ | 2.1  |        |      | kW         |
| Power Output (oscillator)   |           |      |        |      |            |
| at 100% Transfer Efficiency | $P_{out}$ | 2.05 |        |      | kW         |
| Power Output (oscillator)   |           |      |        |      |            |
| at 85% Transfer Efficiency  | $P_{out}$ | 1.75 |        |      | kW         |

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**TYPICAL OPERATION**—At maximum operating conditions.

Class C self oscillator—3-phase full wave rectified or d.c.

|                                                          |           | Mean | R.M.S. | Peak |            |
|----------------------------------------------------------|-----------|------|--------|------|------------|
| Anode Voltage                                            | $V_a$     | 4.0  | 5.0    | 6.0  | kV         |
| Bias Voltage                                             | $V_g$     | -260 | -340   | -500 | V          |
| Positive Grid Voltage                                    | $V_{sig}$ | 260  | 260    | 240  | V          |
| Grid Resistor                                            |           | 1.2  | 1.65   | 3.35 | k $\Omega$ |
| Mean Anode Current                                       | $I_a(av)$ | 815  | 780    | 660  | mA         |
| Mean Grid Current                                        | $I_g(av)$ | 220  | 205    | 150  | mA         |
| Peak Cathode Current                                     | $I_k(pk)$ | 4.0  | 4.0    | 4.0  | A          |
| Peak Anode Current                                       | $I_a(pk)$ | 2.8  | 2.8    | 3.0  | A          |
| Peak Grid Current                                        | $I_g(pk)$ | 1.2  | 1.2    | 1.0  | A          |
| Anode Dissipation                                        | $P_a$     | 800  | 800    | 800  | W          |
| Grid Drive Power                                         |           | 105  | 115    | 105  | W          |
| Grid Dissipation                                         | $P_g$     | 50   | 45     | 30   | W          |
| Anode Efficiency                                         |           | 76   | 79     | 80   | %          |
| Power Output (amplifier)                                 | $P_{out}$ | 2.5  | 3.1    | 3.2  | kW         |
| Power Output (oscillator)<br>at 100% Transfer Efficiency | $P_{out}$ | 2.4  | 3.0    | 3.1  | kW         |
| Power Output (oscillator)<br>at 85% Transfer Efficiency  | $P_{out}$ | 2.0  | 2.5    | 2.6  | kW         |

**TYPICAL OPERATION**—At maximum operating conditions.

Class C self oscillator—single phase self rectified.

|                                                          |           |      |     |     |          |
|----------------------------------------------------------|-----------|------|-----|-----|----------|
| Anode Voltage                                            | $V_a$     | 1.9  | 3.0 | 6.0 | kV       |
| Bias Voltage                                             | $V_g$     | -20  |     |     | V        |
| Positive Grid Voltage                                    | $V_{sig}$ | 120  |     |     | V        |
| Grid Resistor                                            |           | 195  |     |     | $\Omega$ |
| Anode Current                                            | $I_a$     | 430  |     | 900 | mA       |
| Grid Current                                             | $I_g$     | 100  |     | 500 | mA       |
| Cathode Current                                          | $I_k$     | 1.25 | 2.0 | 4.0 | A        |
| Anode Dissipation                                        | $P_a$     | 800  |     |     | W        |
| Grid Drive Power                                         |           | 31   |     |     | W        |
| Grid Dissipation                                         | $P_g$     | 29   |     |     | W        |
| Anode Efficiency                                         |           | 63   |     |     | %        |
| Power Output (amplifier)                                 | $P_{out}$ | 1.25 |     |     | kW       |
| Power Output (oscillator)<br>at 100% Transfer Efficiency | $P_{out}$ | 1.2  |     |     | kW       |
| Power Output (oscillator)<br>at 85% Transfer Efficiency  | $P_{out}$ | 1.0  |     |     | kW       |



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**15D12****RADIATION COOLED TRIODE****Directly heated****DIMENSIONS**

Maximum Overall Length

254 mm

Maximum Diameter

152 mm

**MOUNTING POSITION**—Vertical, anode upwards.**TOP CAP**—Anode**BASE**—Special**OPERATING INSTRUCTIONS****Installation**

The valve should be mounted vertically with the anode upwards. Connections should always make good electrical contact to prevent overheating pins and seals, particularly by r.f. current.

It is essential that connection be made to both grid pins when running at higher frequencies to reduce current taken by each pin. The valve must be protected against excessive vibration and shock.

**Cooling**

Forced air blast is recommended for all conditions of valve service except filament dissipation alone.

An air flow of 50 cu. ft./min. directed vertically upwards on to the grid and filament pins is ample.

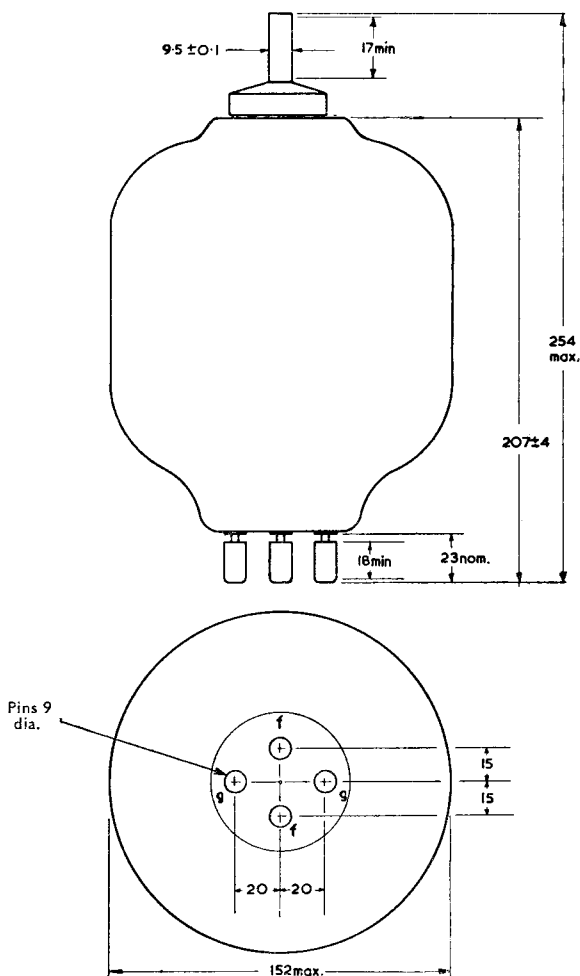
The anode connector should be designed to keep the temperature of the anode seal below the maximum temperature stated.

**Operation**

The operating data list conditions for maximum output for respective classes of service at the relevant anode voltage. Linear interpolation between anode voltage steps is admissible. As these conditions utilize some or all of the maximum valve ratings, close control of conditions has to be maintained.

In Class C self oscillator service, precautions should be taken against excessive mains voltage variation. Current overload trips should be included in anode and grid circuits as well as an under current trip in the grid circuit.

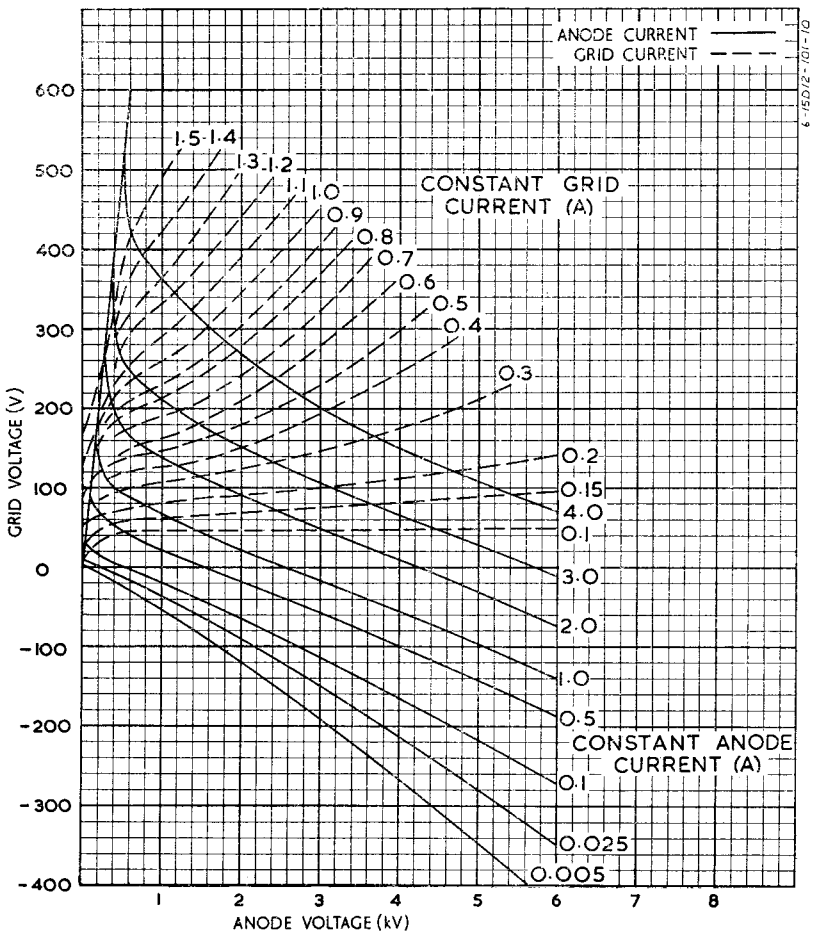
In industrial r.f. heating it is not usual that all precautions can be taken, and under these conditions some reductions in operating conditions have to be made so that widely fluctuating loads, poor h.t. regulation, and mains variations can be accommodated. Each type of variation brings its own problems and no set rules are practicable.



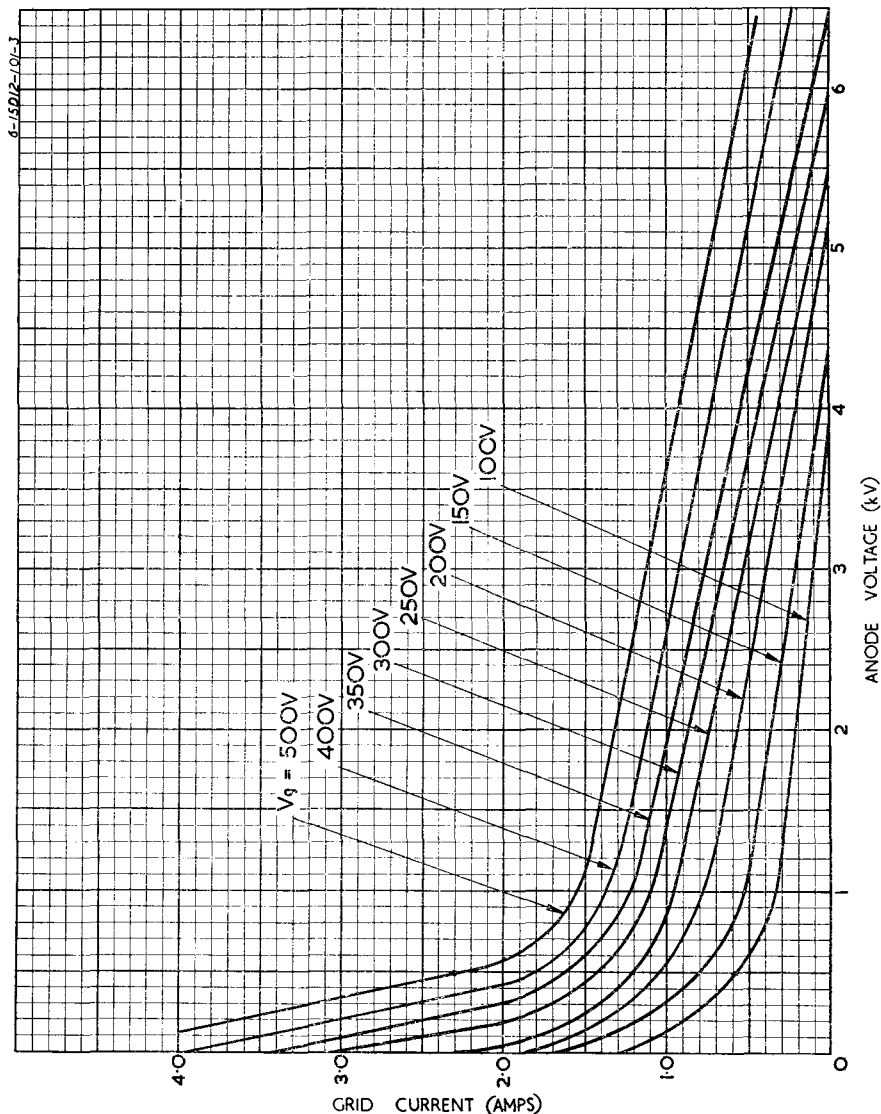
All dimensions in mm.



CONSTANT CURRENT CHARACTERISTICS



### CHARACTERISTIC CURVES : $V_a/I_g$



CHARACTERISTIC CURVES:  $I_a/V_a$ 