



## ELECTRONIC TUBE REFERENCE

# 15D12

Power - Triode electronic tube

CONSOLIDATED TECHNICAL DATA

**1 SECTION**

CONSTRUCTION

**TRIODE**

Directly heated graphite-anode radiation-cooled triode designed specifically for industrial RF-heating equipment, using a thoriated-tungsten filament for substantial high-frequency power.

## GENERAL CHARACTERISTICS

|                     |                   |                      |               |
|---------------------|-------------------|----------------------|---------------|
| BASE DESIGNATION    | —                 | BASE PINS            | —             |
| NOMINAL HEATER      | 6.3 V / 32.5 A    | PARALLEL HEATER      | — / —         |
| HEATING             | Direct            | SERIES OPERATION     | Not specified |
| CATHODE ARRANGEMENT | Separate cathodes | SECTION CONSTRUCTION | Similar       |

## SECTION RATINGS

|                           |               |
|---------------------------|---------------|
| <b>SECTION 1</b> Triode   |               |
| PLATE RESISTANCE          | 4100 $\Omega$ |
| TRANSCONDUCTANCE          | 0.0056 S      |
| AMPLIFICATION FACTOR      | 23            |
| MAXIMUM PLATE VOLTAGE     | 6000 V        |
| MAXIMUM PLATE DISSIPATION | 800 W         |
| MAXIMUM GRID DISSIPATION  | 60 W          |
| MAXIMUM CATHODE CURRENT   | 4 A           |

## 15D12 — Radiation Cooled Power Triode

*A directly heated, radiation-cooled power triode featuring a graphite anode and a thoriated tungsten filament, designed specifically for industrial radio frequency (r.f.) heating equipment and high-power amplification.*

## Overview

The **15D12** is a heavy-duty power triode manufactured by Associated Electrical Industries Limited (AEI) under the Ediswan brand. It is designed with a graphite anode and a directly heated thoriated tungsten filament. The primary intended application for this device is in industrial r.f. heating equipment, where robust construction and high thermal tolerance are critical. The tube is rated for operation at frequencies up to 60 Mc/s and is capable of delivering several kilowatts of output power under Class C conditions.

## Physical Construction and Pin Configuration

The 15D12 is constructed with a large glass bulb designed to facilitate radiation cooling. The physical dimensions of the tube are as follows:

- **Maximum Overall Length:** 254 mm
- **Maximum Diameter:** 152 mm
- **Seated Height (Body Length):**  $207 \pm 4$  mm

The anode connection is located at the top of the envelope via a top cap measuring  $9.5 \pm 0.1$  mm in diameter with a minimum height of 17 mm.

The base of the tube is a specialized four-pin configuration. Each pin has a diameter of 9 mm, with a minimum length of 18 mm and a nominal length of 23 mm. The pins are arranged in a circular pattern with the following spacing relative to the center line:

- **Grid Pins (g):** Two pins are positioned horizontally, spaced 20 mm on either side of the center line (resulting in a 40 mm spacing between them).
- **Filament Pins (f):** Two pins are positioned vertically, spaced 15 mm on either side of the center line (resulting in a 30 mm spacing between them).

## Filament and Cooling Requirements

The directly heated thoriated tungsten filament requires a high-current low-voltage power supply. The nominal filament voltage is **6.3 V**, and the current draws between **31 A and 34 A**.

### Filament Power Calculation

Using the nominal filament voltage ( $V_f = 6.3$  V) and the specified filament current range ( $I_f = 31$  to 34 A), the power consumed by the filament alone is calculated as follows:

- **Minimum Filament Power:**  $6.3 \text{ V} \times 31 \text{ A} = 195.3 \text{ W}$
- **Maximum Filament Power:**  $6.3 \text{ V} \times 34 \text{ A} = 214.2 \text{ W}$

The filament is designed to support direct switching without requiring additional current-limiting circuitry, and it is rated to withstand supply voltage fluctuations of up to  $\pm 5\%$ .

Due to the substantial heat generated during operation, forced air cooling is recommended for all conditions of service, except when only the filament is dissipated. An air flow of 50 cubic feet per minute (cu. ft./min.) directed vertically upwards onto the grid and filament pins is sufficient to prevent

overheating. Additionally, the anode connector must be designed to keep the temperature of the anode seal below its maximum limit.

## Absolute Maximum Ratings

All limiting values for the 15D12 are specified under the Absolute Maximum rating system, rather than Design Centres. These limits must not be exceeded under any operating conditions.

| Rating Parameter             | Symbol          | Value | Unit |
|------------------------------|-----------------|-------|------|
| 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   |

*Note: At the maximum anode dissipation of 800 W, the graphite anode runs at a temperature of approximately 900°C, as determined by optical reading.*

## Electrical Characteristics and Capacitances

Under typical static operating conditions, the triode exhibits the following electrical 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 ( $r_a$ ):** 4.1 k $\Omega$

The inter-electrode capacitances, measured without external shielding, are:

- **Anode to Grid ( $C_{a-g}$ ):** 6.5 pF
- **Grid to Filament ( $C_{g-f}$ ):** 13 pF

- **Anode to Filament ( $C_a-f$ ):** 0.5 pF

## Typical Operating Conditions

The 15D12 is rated for high-power Class B audio amplification and Class C self-oscillator service. The operating points represent configurations optimized for maximum output.

### Class B1 Audio Amplification (Push-Pull, Per Valve)

- **Anode Voltage ( $V_a$ ):** 6.0 kV
- **A.C. Anode Current ( $I_a(r.m.s.)$ ):** 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 ( $V_{sig(pk)}$ ):** 225 V

### Class C Self Oscillator Operating Points

| Parameter                                           | Single-Phase Full-Wave Rectified (No Smoothing)  | 3-Phase Full-Wave Rectified or D.C.                                       | Single-Phase Self-Rectified                     |
|-----------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------|
| <b>Anode Voltage (<math>V_a</math>)</b>             | 3.8 kV (Mean) / 4.25 kV (R.M.S.) / 6.0 kV (Peak) | 4.0 kV (Mean) / 5.0 kV (R.M.S.) / 6.0 kV (Peak)                           | 1.9 kV (Mean) / 3.0 kV (R.M.S.) / 6.0 kV (Peak) |
| <b>Bias Voltage (<math>V_g</math>)</b>              | -150 V                                           | -260 V (Mean) / -340 V (R.M.S.) / -500 V (Peak)                           | -20 V                                           |
| <b>Positive Grid Voltage (<math>V_{sig}</math>)</b> | 180 V                                            | 260 V (Mean) / 260 V (R.M.S.) / 240 V (Peak)                              | 120 V                                           |
| <b>Grid Resistor</b>                                | 1.05 k $\Omega$                                  | 1.2 k $\Omega$ (Mean) / 1.65 k $\Omega$ (R.M.S.) / 3.35 k $\Omega$ (Peak) | 195 $\Omega$                                    |
| <b>Anode Current (<math>I_a</math>)</b>             | 625 mA (Mean) / 1700 mA (Peak)                   | 815 mA (Mean) / 780 mA (R.M.S.) / 660 mA (Peak)                           | 430 mA (Mean) / 900 mA (Peak)                   |
| <b>Grid Current (<math>I_g</math>)</b>              | 140 mA (Mean) / 800 mA (Peak)                    | 220 mA (Mean) / 205 mA (R.M.S.) / 150 mA (Peak)                           | 100 mA (Mean) / 500 mA (Peak)                   |

| Parameter                                       | Single-Phase Full-Wave Rectified (No Smoothing) | 3-Phase Full-Wave Rectified or D.C.             | Single-Phase Self-Rectified                   |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-----------------------------------------------|
| <b>Cathode Current (<math>I_k</math>)</b>       | 2.55 A (Mean) / 2.8 A (R.M.S.) / 4.0 A (Peak)   | 4.0 A (Mean) / 4.0 A (R.M.S.) / 4.0 A (Peak)    | 1.25 A (Mean) / 2.0 A (R.M.S.) / 4.0 A (Peak) |
| <b>Anode Dissipation (<math>P_a</math>)</b>     | 800 W                                           | 800 W (Mean) / 800 W (R.M.S.) / 800 W (Peak)    | 800 W                                         |
| <b>Grid Drive Power</b>                         | 55 W                                            | 105 W (Mean) / 115 W (R.M.S.) / 105 W (Peak)    | 31 W                                          |
| <b>Grid Dissipation (<math>P_g</math>)</b>      | 25 W                                            | 50 W (Mean) / 45 W (R.M.S.) / 30 W (Peak)       | 29 W                                          |
| <b>Anode Efficiency</b>                         | 72%                                             | 76% (Mean) / 79% (R.M.S.) / 80% (Peak)          | 63%                                           |
| <b>Power Output (Amplifier)</b>                 | 2.1 kW                                          | 2.5 kW (Mean) / 3.1 kW (R.M.S.) / 3.2 kW (Peak) | 1.25 kW                                       |
| <b>Power Output (Oscillator, 100% Transfer)</b> | 2.05 kW                                         | 2.4 kW (Mean) / 3.0 kW (R.M.S.) / 3.1 kW (Peak) | 1.2 kW                                        |
| <b>Power Output (Oscillator, 85% Transfer)</b>  | 1.75 kW                                         | 2.0 kW (Mean) / 2.5 kW (R.M.S.) / 2.6 kW (Peak) | 1.0 kW                                        |

## Installation and Operational Guidelines

To ensure reliable operation and long service life, the following installation and operational guidelines must be strictly observed:

- **Mounting Position:** The valve must be mounted vertically with the anode top cap facing upwards.
- **Electrical Connections:** All electrical connections must make excellent contact to prevent localized overheating of the pins and seals, which is especially critical when handling high r.f. currents.
- **Grid Pin Connection:** When operating at higher frequencies, it is essential to connect to *both* grid pins. This parallel connection reduces the current carried by each individual pin, preventing thermal damage.
- **Mechanical Protection:** The tube must be protected against excessive vibration and shock.
- **Circuit Protection:** In Class C self-oscillator service, precautions must be taken against excessive mains voltage variations. Current overload trips should be included in both the anode and grid circuits, and an under-current trip should be installed in the grid circuit.
- **Industrial R.F. Heating Adjustments:** In industrial heating applications, where loads fluctuate widely and mains or H.T. regulation may be poor, operating conditions should be conservatively

reduced to accommodate these variations.

## Characteristic Curves

The published characteristic curves provide a detailed graphical representation of the tube's behavior across various operating regions:

- **Constant Current Characteristics:** Plotting grid voltage against anode voltage reveals lines of constant grid current (extending up to 1.5 A in the positive grid region) and constant anode current (ranging from 0.005 A up to 4.0 A). These curves are valuable for determining optimal bias and drive levels in Class C configurations.
- **Grid Current vs. Anode Voltage ( $V_a/I_g$ ):** These curves show grid current as a function of anode voltage for positive grid voltages ( $V_g$ ) ranging from +100 V to +500 V. Grid current decreases as anode voltage increases, reflecting the partition of cathode current between the grid and the anode.
- **Anode Current vs. Anode Voltage ( $I_a/V_a$ ):** These curves map anode current against anode voltage for grid voltages ranging from -300 V up to +500 V. They illustrate the triode's transition from cutoff to full saturation, showing highly linear regions suitable for high-power amplification.

## Technical Summary

The **15D12** is a high-power, directly heated, radiation-cooled triode designed for industrial r.f. heating and high-power amplification. With a maximum anode dissipation of 800 W and a peak anode voltage rating of 6.0 kV, it delivers robust performance in Class B and Class C configurations. Its thoriated tungsten filament requires a substantial 6.3 V, 31–34 A supply, and its physical installation requires vertical mounting, forced-air cooling of the pins, and dual-grid connections at high frequencies. The 15D12 remains a highly specialized component engineered for high efficiency and reliability under demanding industrial conditions.



## SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

# 1961 AEI Industrial Valves

Published test conditions and operating points. Values on this page are preserved as reported by this source.

## 1961 AEI INDUSTRIAL VALVES

## Section 1 · Triode

| OTHER                       |                 |                  |
|-----------------------------|-----------------|------------------|
| PARAMETER                   | PUBLISHED VALUE | CONDITION / NOTE |
| Maximum operating frequency | 60 MHz          | —                |

| CAPACITANCE                |                 |                  |
|----------------------------|-----------------|------------------|
| PARAMETER                  | PUBLISHED VALUE | CONDITION / NOTE |
| Anode-grid capacitance     | 6.5 pF          | —                |
| Grid-filament capacitance  | 13 pF           | —                |
| Anode-filament capacitance | 0.5 pF          | —                |



## SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

# 1961 Associated Electrical Industries

Published test conditions and operating points. Values on this page are preserved as reported by this source.

## 1961 ASSOCIATED ELECTRICAL INDUSTRIES

## Section 1 · Triode

| OTHER                       |                 |                  |
|-----------------------------|-----------------|------------------|
| PARAMETER                   | PUBLISHED VALUE | CONDITION / NOTE |
| Maximum operating frequency | 60 MHz          | —                |

| CAPACITANCE               |                 |                  |
|---------------------------|-----------------|------------------|
| PARAMETER                 | PUBLISHED VALUE | CONDITION / NOTE |
| Anode-grid capacitance    | 6.5 pF          | —                |
| Grid-filament capacitance | 13 pF           | —                |
|                           |                 |                  |

| PARAMETER                  | PUBLISHED VALUE | CONDITION / NOTE |
|----------------------------|-----------------|------------------|
| Anode-filament capacitance | 0.5 pF          | —                |

## TUBE TINKER

An independent reference for electronic tubes, vacuum tubes, and their source documents.

[Catalog](#)   [Tube types](#)   [Full books](#)   [Blog](#)   [Feedback & corrections](#)

© 2026 Tube Tinker