



## ELECTRONIC TUBE REFERENCE

# 15V12

Power - Triode electronic tube

CONSOLIDATED TECHNICAL DATA

**1 SECTION**

CONSTRUCTION

**TRIODE**

Directly heated vapor-cooled triode designed specifically for industrial RF-heating equipment, with full-rating operation documented to approximately 60 MHz.

## 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   |          |
| TRANSCONDUCTANCE          | 0.0051 S |
| AMPLIFICATION FACTOR      | 22       |
| MAXIMUM PLATE VOLTAGE     | 7000 V   |
| MAXIMUM PLATE DISSIPATION | 1300 W   |

## 15V12 — Vapour-Cooled Power Triode

*An industrial, directly heated power triode designed for radio-frequency heating applications, featuring vapour cooling and high power capabilities.*

### Overview

The **15V12** is a directly heated, vapour-cooled power triode designed primarily for use in radio-frequency (r.f.) heating equipment. Manufactured by Associated Electrical Industries Limited (AEI) under the Ediswan brand, this heavy-duty industrial valve features a thoriated tungsten filament and is rated for a

maximum operating frequency of 60 Mc/s at full ratings. Its design utilizes vapour cooling, requiring specialized installation and cooling arrangements to manage its substantial power capabilities, including a maximum anode dissipation of 1.3 kW.

## Construction, Filament, and Physical Dimensions

The 15V12 is constructed with a thoriated tungsten filament designed for direct heating. The physical envelope has a maximum overall length of 200 mm and a maximum diameter of 80 mm. The tube features a specialized base and requires a specific mounting orientation.

### Filament and Electrical Ratings

The filament requires a high-current, low-voltage supply:

| Filament Parameter         | Value              |
|----------------------------|--------------------|
| Filament Voltage ( $V_f$ ) | 6.3 V              |
| Filament Current ( $I_f$ ) | 32.5 A             |
| Heating Method             | Direct             |
| Filament Material          | Thoriated tungsten |

The calculated filament power consumption is:  $\text{Filament Power} = 6.3 \text{ V} \times 32.5 \text{ A} = 204.75 \text{ W}$

### Physical and Mounting Specifications

- **Maximum Overall Length:** 200 mm
- **Maximum Diameter:** 80 mm
- **Mounting Position:** Vertical, base up
- **Base Type:** Special

### Inter-Electrode Capacitances

The internal capacitances of the 15V12 are:

- **Grid to Filament ( $C_{g-f}$ ):** 13 pF
- **Anode to Grid ( $C_{a-g}$ ):** 11 pF
- **Anode to Filament ( $C_{a-f}$ ):** 0.6 pF

## Installation, Cooling, and Operating Instructions

Due to the high power levels and high-frequency operation of the 15V12, strict adherence to installation and cooling protocols is required.

## Installation and Mounting

The valve must be mounted vertically with the base up, which positions the anode downwards. The anode is designed to be immersed in a specially designed boiler, specifically the **type LM287**. All electrical connections must make excellent contact to prevent localized overheating of the pins and seals, which is a particular risk when carrying high r.f. currents.

The tube features dual grid pins. When operating at higher frequencies, it is essential to connect both grid pins in parallel. This configuration splits the grid current, reducing the electrical and thermal load on each individual pin.

## Cooling Requirements

Cooling is achieved primarily through vapour cooling, where the anode is immersed in water within the boiler. At higher operating frequencies, water immersion alone is insufficient for the entire structure; a low-velocity air blast must also be directed onto the filament and grid pins to prevent thermal damage to the glass-to-metal seals.

## Operational Precautions

Because typical operating conditions utilize the valve near its maximum ratings, close control of operating parameters is necessary:

- **Linear Interpolation:** Linear interpolation between the specified anode voltage steps is permissible when setting up operating points.
- **Mains Variations:** In Class C self-oscillator service, precautions must be taken to guard against excessive mains voltage variations.
- **Protection Circuitry:** Circuits should incorporate current overload trips in both the anode and grid lines, alongside an under-current trip in the grid circuit to protect the tube from loss of bias.
- **Industrial R.F. Heating Adjustments:** In industrial environments where ideal operating conditions cannot always be maintained, reductions in operating parameters are recommended to accommodate fluctuating loads, poor high-tension (h.t.) regulation, and mains supply variations.

## Electrical Characteristics and Ratings

The 15V12 is characterized by high voltage and power handling capabilities. Under standard test conditions, its basic electrical characteristics are defined at an anode voltage of 4.0 kV:

| Parameter                      | Value    |
|--------------------------------|----------|
| Anode Voltage ( $V_a$ )        | 4.0 kV   |
| Anode Current ( $I_a$ )        | 190 mA   |
| Mutual Conductance ( $g_m$ )   | 5.1 mA/V |
| Amplification Factor ( $\mu$ ) | 22       |

## Absolute Maximum Ratings

The maximum limits for safe operation of the 15V12 are:

- **Maximum Anode Voltage ( $V_a(\text{max})$ ):** 7.0 kV
- **Maximum Anode Dissipation ( $P_a(\text{max})$ ):** 1.3 kW
- **Maximum Operating Frequency at Full Ratings ( $f_{\text{max}}$ ):** 60 Mc/s

## Typical Operating Conditions

The 15V12 can be operated in several classes of service, including Class B1 audio amplification and Class C r.f. power amplification or oscillation.

### Class B1 Audio Amplifier (Push-Pull Operation)

For push-pull audio service, the maximum operating conditions per valve are:

| Parameter                                     | Value  |
|-----------------------------------------------|--------|
| Anode Voltage ( $V_a$ )                       | 6.0 kV |
| Negative Grid Bias Voltage ( $V_g$ )          | -225 V |
| Peak Signal Voltage ( $V_{\text{sig(pk)}}$ )  | 225 V  |
| Anode Current R.M.S. ( $I_a(\text{r.m.s.})$ ) | 0.6 A  |
| Power Input ( $P_{\text{in}}$ )               | 2.2 kW |
| Power Output ( $P_{\text{out}}$ )             | 0.9 kW |
| Anode Dissipation ( $P_a$ )                   | 1.3 kW |
| Anode Efficiency                              | 40%    |

### Class C Single-Phase Full-Wave (No Smoothing)

When operated with an unsmoothed single-phase full-wave supply, the typical maximum operating conditions are:

| Parameter                                  | Mean   | R.M.S.  | Peak   |
|--------------------------------------------|--------|---------|--------|
| Anode Voltage ( $V_a$ )                    | 3.8 kV | 4.25 kV | 6.0 kV |
| Negative Grid Bias Voltage ( $V_g$ )       | -80 V  | —       | —      |
| Positive Grid Voltage ( $V_{\text{sig}}$ ) | 154 V  | —       | —      |

| Parameter                                | Mean        | R.M.S. | Peak  |
|------------------------------------------|-------------|--------|-------|
| Grid Resistance ( $R_g$ )                | 0.7 k\Omega | —      | —     |
| Mean Anode Current ( $I_{a(av)}$ )       | 730 mA      | —      | —     |
| Mean Grid Current ( $I_{g(av)}$ )        | 120 mA      | —      | —     |
| Peak Cathode Current ( $i_{k(pk)}$ )     | 2.5 A       | 2.8 A  | 4.0 A |
| Peak Anode Current ( $i_{a(pk)}$ )       | —           | —      | 1.9 A |
| Peak Grid Current ( $i_{g(pk)}$ )        | —           | —      | 0.6 A |
| Anode Dissipation ( $P_a$ )              | 1.3 kW      | —      | —     |
| Grid Drive Power                         | 30 W        | —      | —     |
| Grid Dissipation ( $P_g$ )               | 20 W        | —      | —     |
| Anode Efficiency                         | 61%         | —      | —     |
| Power Output (Amplifier) ( $P_{out}$ )   | 2.1 kW      | —      | —     |
| Power Output (Oscillator, 100% Transfer) | 2.1 kW      | —      | —     |
| Power Output (Oscillator, 85% Transfer)  | 1.8 kW      | —      | —     |

## Class C (3-Phase Rectified or D.C.)

For operation with a three-phase rectified or pure D.C. supply, three typical operating points are specified:

| Parameter                            | Point 1 | Point 2 | Point 3 |
|--------------------------------------|---------|---------|---------|
| Anode Voltage ( $V_a$ )              | 4.0 kV  | 5.0 kV  | 6.0 kV  |
| Negative Grid Bias Voltage ( $V_g$ ) | -140 V  | -220 V  | -300 V  |

| Parameter                                | Point 1      | Point 2      | Point 3       |
|------------------------------------------|--------------|--------------|---------------|
| Positive Grid Voltage ( $V_{sig}$ )      | 270 V        | 270 V        | 270 V         |
| Grid Resistance ( $R_g$ )                | 553 $\Omega$ | 982 $\Omega$ | 1400 $\Omega$ |
| Mean Anode Current ( $I_{a(av)}$ )       | 1068 mA      | 993 mA       | 930 mA        |
| Mean Grid Current ( $I_{g(av)}$ )        | 253 mA       | 224 mA       | 204 mA        |
| Peak Cathode Current ( $i_{k(pk)}$ )     | 4.0 A        | 4.0 A        | 4.0 A         |
| Peak Anode Current ( $i_{a(pk)}$ )       | 3.0 A        | 3.0 A        | 3.0 A         |
| Peak Grid Current ( $i_{g(pk)}$ )        | 1.0 A        | 1.0 A        | 1.0 A         |
| Anode Dissipation ( $P_a$ )              | 1.3 kW       | 1.3 kW       | 1.3 kW        |
| Grid Drive Power                         | 104 W        | 100 W        | 108 W         |
| Grid Dissipation ( $P_g$ )               | 60 W         | 50 W         | 48 W          |
| Anode Efficiency                         | 69%          | 73%          | 76%           |
| Power Output (Amplifier) ( $P_{out}$ )   | 2.9 kW       | 3.6 kW       | 4.2 kW        |
| Power Output (Oscillator, 100% Transfer) | 2.8 kW       | 3.5 kW       | 4.1 kW        |
| Power Output (Oscillator, 85% Transfer)  | 2.4 kW       | 3.0 kW       | 3.5 kW        |

## Technical Summary

The **15V12** is a high-power, vapour-cooled, directly heated triode designed for demanding industrial r.f. heating and amplification applications. Operating with a 6.3 V, 32.5 A thoriated tungsten filament, the tube is capable of handling anode voltages up to 7.0 kV and dissipating up to 1.3 kW at the anode. It features an amplification factor of 22 and a mutual conductance of 5.1 mA/V.

To ensure reliable operation up to its maximum frequency of 60 Mc/s, the 15V12 must be mounted vertically (base up) with its anode immersed in a specialized LM287 boiler, supplemented by forced-air cooling on the filament and grid pins at higher frequencies. Dual grid pins must be connected in parallel to distribute high-frequency grid currents. With its high efficiency (up to 76% in Class C d.c. operation) and robust power output capabilities (up to 4.2 kW in Class C amplifier service), the 15V12 is a highly specialized component engineered for heavy-duty industrial and high-frequency applications.



## 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 |
| Grid-filament capacitance  | 13 pF           | —                |
| Anode-grid capacitance     | 11 pF           | —                |
| Anode-filament capacitance | 0.6 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 |
| Grid-filament capacitance | 13 pF           | —                |
| Anode-grid capacitance    | 11 pF           | —                |
|                           |                 |                  |

| PARAMETER                  | PUBLISHED VALUE | CONDITION / NOTE |
|----------------------------|-----------------|------------------|
| Anode-filament capacitance | 0.6 pF          | —                |

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