

ELECTRONIC TUBE REFERENCE

15J12

Power - Triode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
TRIODE

Directly heated forced-air-cooled triode designed specifically for industrial RF-heating equipment, using a thoriated-tungsten filament for substantial continuous 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

SECTION1 Triode	
TRANSCONDUCTANCE	0.0051 S
AMPLIFICATION FACTOR	22
MAXIMUM PLATE VOLTAGE	7000 V
MAXIMUM PLATE DISSIPATION	1300 W
MAXIMUM CATHODE CURRENT	4 A

15J12 — Forced-Air Cooled Power Triode

A directly heated, forced-air cooled power triode designed primarily for industrial radio-frequency (r.f.) heating applications and high-power amplification.

Overview

The **15J12** is a heavy-duty power triode featuring a directly heated thoriated tungsten filament and an external anode design. Developed by Associated Electrical Industries Limited (AEI) under the Ediswan

brand, this tube is primarily engineered for industrial r.f. heating equipment, high-frequency oscillation, and class-level power amplification. The device is characterized by its robust construction, high power handling capabilities, and the requirement for forced-air cooling to manage anode dissipation.

Filament and Cooling Requirements

The 15J12 utilizes a high-current, directly heated thoriated tungsten filament. Due to the substantial power consumed by the filament, proper electrical contact and thermal management are critical.

Filament Parameter	Value
Nominal Filament Voltage (V_f)	6.3 V
Nominal Filament Current (I_f)	32.5 A
Calculated Filament Power (P_f)	204.75 W

Note: The filament power of 204.75 W is a calculation derived from the nominal voltage and current (6.3 V x 32.5 A).

Cooling Specifications

To maintain safe operating temperatures at maximum ratings, forced-air cooling is mandatory:

- **Anode Cooling:** A minimum forced-air flow of **60 cubic feet per minute (ft³/min)** is required. This air blast must be directed horizontally at the external anode structure.
- **Pin and Seal Cooling:** At higher operating frequencies, a low-velocity auxiliary air blast directed onto the filament and grid pins is recommended to prevent overheating of the metal-to-glass seals and pins.

Physical Construction, Basing, and Mounting

The physical design of the 15J12 is optimized for high-power r.f. environments. It features an external anode integrated with a transverse-finned radiator assembly for efficient heat transfer.

Mechanical Dimensions

- **Maximum Overall Length:** 200 mm
- **Maximum Radiator Diameter:** 102 mm
- **Radiator Assembly Length:** 175 mm (maximum)
- **Base Diameter:** 74 mm (nominal)
- **Pin Length:** 23 mm (nominal), with an 18 mm minimum exposure
- **Pin Diameter:** 9 mm

Basing and Electrical Connections

The tube uses a special base configuration with four heavy-duty pins, each measuring 9 mm in diameter. The pinout consists of:

- **Filament (f):** Two pins dedicated to the thoriated tungsten filament.
- **Grid (g):** Two separate pins connected to the control grid.
- **Anode:** Connection is made directly to the external radiator body.

To prevent localized overheating and excessive r.f. current concentration in a single terminal, it is essential to connect the external circuit to **both grid pins** simultaneously when operating at higher frequencies. This dual-connection design distributes the r.f. current evenly between the two pins.

Mounting Position

The 15J12 must be mounted **vertically with the anode pointing upwards**. It must also be protected against excessive mechanical vibration and shock to preserve the integrity of the internal filament structure and glass-to-metal seals.

Electrical Ratings and Characteristics

The maximum ratings represent absolute limits that must not be exceeded under any operational state.

Absolute Maximum Ratings

- **Maximum Anode Voltage ($V_{a(max)}$):** 7.0 kV
- **Maximum Anode Dissipation ($P_{a(max)}$):** 1.3 kW
- **Maximum Peak Cathode Current ($i_{k(pk)max}$):** 4.0 A
- **Maximum Operating Frequency (f_{max}):** 60 Mc/s (at full ratings)

Inter-Electrode Capacitances

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

Static Characteristics

Measured at an anode voltage (V_a) of 4.0 kV and an anode current (I_a) of 190 mA:

- **Mutual Conductance (g_m):** 5.1 mA/V
- **Amplification Factor (μ):** 22

Typical Operating Conditions

The 15J12 can be operated in several classes of service. The published operating points represent maximum conditions for each specific class.

Class B1 Audio Amplifier (Push-Pull Operation, Per Valve)

In Class B1 service, the grid is not driven into the positive region (no grid current flows).

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

Class C Single Phase Full Wave (No Smoothing)

This operating mode is typical for industrial power supplies where raw, unsmoothed rectified AC is applied to the anode.

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_{sig})	—	—	154 V
Grid Resistance (R_g)	0.7 k Ω	—	—
Mean Anode Current ($I_{a(av)}$)	730 mA	—	—
Mean Grid Current ($I_{g(av)}$)	120 mA	—	—

Parameter	Mean	R.M.S.	Peak
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 smooth DC supply or a three-phase rectified supply, three distinct anode voltage operating points are established:

Parameter	4.0 kV Supply	5.0 kV Supply	6.0 kV Supply
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
Positive Grid Voltage (V_{sig})	270 V	270 V	270 V
Grid Resistance (R_g)	553 Ω	982 Ω	1400 Ω
Mean Anode Current ($I_{a(av)}$)	1068 mA	993 mA	930 mA

Parameter	4.0 kV Supply	5.0 kV Supply	6.0 kV Supply
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

Installation and Operating Guidelines

Because the typical operating points utilize the tube near its absolute maximum ratings, strict control of operating conditions is required. Linear interpolation between the documented anode voltage steps is permissible.

Circuit Protection

In Class C self-oscillator service, precautions must be taken to protect the tube against excessive mains voltage variations. The following safety devices should be integrated into the system:

- 1. Current Overload Trips:** Installed in both the anode and grid circuits to interrupt power in the event of an overcurrent condition.
- 2. Undercurrent Trip:** Installed in the grid circuit to protect the tube from loss of bias, which would otherwise lead to runaway anode dissipation.

Industrial R.F. Heating Considerations

In industrial environments, it is often impractical to implement perfect voltage regulation and load matching. Under these conditions, the operating parameters must be reduced. This derating accommodates:

- Widely fluctuating load impedances (common during the heating cycle of various materials).
- Poor high-tension (h.t.) power supply regulation.
- Mains supply voltage variations.

Because each industrial installation presents unique load-coupling and regulation challenges, no universal set of rules applies, and operating points must be adjusted empirically to keep the tube within its 1.3 kW anode dissipation limit.

Technical Summary

The **15J12** is a high-power, forced-air cooled triode designed for demanding industrial r.f. heating and amplification roles. Operating with a **6.3 V, 32.5 A** thoriated tungsten filament, the tube provides an amplification factor of **22** and a mutual conductance of **5.1 mA/V** under static conditions. It is rated for a maximum anode voltage of **7.0 kV** and an anode dissipation of **1.3 kW**, supported by a mandatory horizontal forced-air flow of **60 ft³/min**. With its dual grid-pin design and external anode, the 15J12 delivers up to **4.2 kW** of r.f. power output in Class C configurations, making it a highly capable component 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	—

COOLING		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum air flow at maximum dissipation	60 ft ³ /min	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode-grid capacitance	11 pF	—
Grid-filament capacitance	13 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	—

COOLING		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum air flow at maximum dissipation	60 ft ³ /min	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode-grid capacitance	11 pF	—
Grid-filament capacitance	13 pF	—