

ELECTRONIC TUBE REFERENCE

18004

Power - Triode Single (under 10W) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
TRIODE

Directly heated Philips triode designed for telephone equipment and output service, providing low-frequency power amplification in communications circuits.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	4.4 V / 970 mA	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	2300 Ω
TRANSCONDUCTANCE	0.001 S
AMPLIFICATION FACTOR	2.3
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	3.5 W
MAXIMUM CATHODE CURRENT	35 mA
Output triode.	

18004 — Low-Mu Power Triode

The **18004** (also known under the Philips "Miniwatt" brand) is a directly heated power triode designed specifically for use as an output valve in telephone equipment. It is characterized by a low amplification factor, low internal resistance, and robust construction suitable for telecommunications applications.

Mechanical and Physical Specifications

The 18004 is constructed with a glass bulb envelope and has the following physical dimensions:

- **Maximum Diameter:** 48 mm
- **Maximum Height:** 118 mm (excluding pins)
- **Maximum Pin Length:** 9.5 mm

The tube features a standard 4-pin base. The pinout configuration is designated as follows:

- **Filament** (f , f)
- **Anode** (a)
- **Grid** (g)

Filament and Heating

The 18004 utilizes a directly heated filament designed for parallel DC supply operation.

- **Filament Voltage** (V_f): 4.4 V
- **Filament Current** (I_f): 0.97 A
- **Heating Type:** Direct by D.C., parallel supply

The calculated power consumption of the filament is approximately 4.27 W (derived from 4.4 V multiplied by 0.97 A).

Interelectrode Capacitances

The internal capacitances between the electrodes of the 18004 are:

- **Anode Capacity** (C_a): 2.5 pF
- **Grid Capacity** (C_g): 2.9 pF
- **Anode-to-Grid Capacity** (C_{ag}): 4.5 pF

Typical Electrical Characteristics

At the standard test operating point, the 18004 exhibits the following electrical characteristics:

- **Anode Voltage** (V_a): 130 V
- **Grid Voltage** (V_g): -25 V
- **Anode Current** (I_a): 22 mA
- **Mutual Conductance** (S): 1.0 mA/V
- **Amplification Factor** (μ): 2.3
- **Internal Resistance** (R_i): 2.3 k

The relationship between these parameters aligns with the standard triode formula, where the amplification factor (μ) is approximately equal to the product of the mutual conductance (S) and the

internal resistance (R_i): $1.0 \text{ mA/V} \times 2.3 \text{ k}\Omega = 2.3$

Operating Conditions as an Output Valve

When operated as a class-A output stage in telephone equipment, the recommended operating conditions are:

- **Anode Voltage (V_a):** 130 V
- **Grid Voltage (V_g):** -25 V
- **Anode Load Resistance (R_a):** 2.1 k
- **Anode Current (I_a):** 22 mA
- **Output Power (W_o):** 0.2 W
- **Total Distortion (d_{tot}):** Less than 5%

Limiting Values (Absolute Maxima)

To ensure reliable operation and prevent damage, the following absolute maximum ratings must be observed:

- **Cold Anode Voltage (V_{a0}):** Max. 300 V
- **Anode Voltage (V_a):** Max. 150 V
- **Anode Dissipation (W_a):** Max. 3.5 W
- **Cathode Current (I_k):** Max. 35 mA
- **Grid Current Start Point (V_g at $I_g = +0.3 \mu\text{A}$):** Max. -1.3 V
- **Grid Resistance (R_g):** Max. 1 M

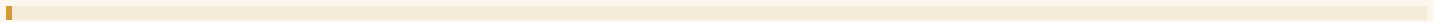
Analysis of Characteristic Curves

The electrical behavior of the 18004 is further described by its characteristic curves:

- **Anode Characteristics (I_a vs. V_a):** The family of curves plotted for grid voltages (V_g) from 0 V down to -60 V in 10 V steps shows typical triode behavior up to an anode current of 60 mA and an anode voltage of 200 V.
- **Transfer Characteristics (I_a vs. V_{g1}):** Plotted at a filament voltage of 4.4 V and an anode voltage of 130 V, the transfer curve shows a smooth, quadratic-like rise. The curve indicates a cutoff region between -70 V and -80 V, rising to approximately 50 mA as the grid voltage approaches 0 V.

Technical Summary

The **18004** is a specialized, directly heated low-mu power triode designed for telephone equipment output stages. Operating with a 4.4 V, 0.97 A filament, it delivers 0.2 W of output power with less than 5% total distortion under typical operating conditions (130 V anode, -25 V grid bias). With an internal resistance of 2.3 k and a maximum anode dissipation of 3.5 W, the 18004 provides robust and stable performance in low-frequency telecommunications applications.





SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1957 Philips Receiving and Amplifying Tubes

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

1957 PHILIPS RECEIVING AND AMPLIFYING TUBES

Section 1 · Triode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode Voltage	130 V	—
Grid Voltage	-25 V	—
Anode Current	22 mA	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1999 Philips 0-D

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

1999 PHILIPS 0-D

Section 1 · Triode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode capacitance	2.5 pF	—
Input capacitance	2.9 pF	—
Anode-grid capacitance	4.5 pF	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Typical plate voltage	130 V	—
Typical grid voltage	-25 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Typical plate current	22 mA	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Load resistance	2100 ohm	OutputValve
Output power	0.2 W	OutputValve;Distortion<5%
Maximum operating plate voltage	150 V	—
Maximum grid circuit resistance	1 Mohm	—