

ELECTRONIC TUBE REFERENCE

18014

Power - Pentode Single (NOT beam) (under 10W) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
PENTODE

Long-life Philips pentode for telephone and communications equipment, with documented preamplifier and output-stage operating conditions.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	4 V / 1.6 A	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Pentode	
TRANSCONDUCTANCE	0.008 S
MAXIMUM PLATE VOLTAGE	220 V
MAXIMUM SCREEN VOLTAGE	220 V
MAXIMUM PLATE DISSIPATION	7 W
MAXIMUM SCREEN DISSIPATION	1 W
MAXIMUM CATHODE CURRENT	50 mA
Indirectly heated Philips pentode for telephone equipment, with published preamplifier and output-stage operating conditions.	

18014 — Telephone Equipment Pentode

Overview

The **18014** is an indirectly heated pentode designed specifically for use in professional telephone equipment. It is engineered to perform reliably as either a pre-amplifier or an output valve in telecommunication systems. The tube features a robust construction with a metallized shield envelope, a 4 V heater, and a high mutual conductance of 8 mA/V, making it highly suitable for stable, low-distortion amplification.

Construction, Heater, and Physical Dimensions

The 18014 is constructed with an indirectly heated cathode designed for parallel supply using either alternating current (A.C.) or direct current (D.C.). The external envelope features a metallized shield coating (indicated by the connection *m*) to minimize external noise and electromagnetic interference, which is critical in sensitive telephone pre-amplifier stages.

The physical dimensions of the tube are as follows:

- **Maximum Diameter:** 46 mm
- **Maximum Height (excluding pins):** 126 mm
- **Base Pin Length:** Maximum 18 mm

Heater Characteristics

The heater is designed for low-voltage, high-current operation:

- **Heater Voltage (V_f):** 4 V
- **Heater Current (I_f):** 1.6 A
- **Heating Method:** Indirect (A.C. or D.C., parallel supply)

Pinout and Connections

The 18014 has been documented with slight variations in its pinout configurations and electrode terminations. In some configurations, the control grid (g_1) is terminated at a top cap, while in others, it is assigned to a base pin. The suppressor grid (g_3) is internally connected to the cathode (k).

Configuration A (Top Cap Control Grid)

In this layout, the control grid is located on the top cap of the envelope:

- **Top Cap:** Control Grid (g_1)
- **Pin 2:** Cathode and Suppressor Grid (k, g_3)
- **Pin 3:** Heater (f)
- **Pin 4:** Heater (f)

- **Pin 5:** Screen Grid (g_2)
- **Pin 7:** Metallization/Shield (m)
- **Pin 8:** Anode (a)
- **Pin 10:** Cathode and Suppressor Grid (k, g_3)

Configuration B (Base-Terminated Control Grid)

An alternative documentation layout lists the connections as follows:

- **Pin 1:** Control Grid (g_1)
- **Pin 3:** Heater (f)
- **Pin 4:** Heater (f)
- **Pin 5:** Screen Grid (g_2)
- **Pin 6:** Metallization/Shield (m)
- **Pin 8:** Anode (a)
- **Pin 10:** Cathode and Suppressor Grid (k, g_3)

Interelectrode Capacitances

The interelectrode capacitances of the 18014 reflect its design as a high-frequency telephone pentode, featuring low feedback capacitance to prevent instability:

- **Anode Capacitance (C_a):** 13 pF
- **Control Grid Capacitance (C_{g1}):** 15 pF
- **Feedback Capacitance (C_{ag1}):** < 0.6 pF
- **Grid-to-Heater Capacitance (C_{g1f}):** < 2 pF

Typical Electrical Characteristics

At a standard operating point, the 18014 exhibits the following typical characteristics:

- **Anode Voltage (V_a):** 200 V
- **Screen Grid Voltage ($V_{[g2]}$ (/tubes/G2)):** 200 V
- **Cathode Bias Resistor (R_k):** 125 Ω
- **Anode Current (I_a):** 35 mA
- **Screen Grid Current ($I_{[g2]}$ (/tubes/G2)):** 4.6 mA
- **Mutual Conductance (S):** 8 mA/V
- **Amplification Factor (μ_{g2g1}):** 20 (from screen grid to control grid)
- **Internal Resistance (R_i):** 50 k Ω

Operating Conditions

As a Pre-Amplifier

When configured as a pre-amplifier, the tube operates under the typical characteristics with an anode load resistor (R_a) of 8 k Ω .

- **Anode Voltage (V_a):** 200 V
- **Screen Grid Voltage ($V_{[g2]}$ (/tubes/G2)):** 200 V
- **Cathode Resistor (R_k):** 125 Ω
- **Anode Load Resistor (R_a):** 8 k Ω
- **Anode Current (I_a):** 35 mA
- **Screen Grid Current ($I_{[g2]}$ (/tubes/G2)):** 4.6 mA
- **Mutual Conductance (S):** 8 mA/V
- **Internal Resistance (R_i):** 50 k Ω
- **Voltage Gain (V_o/V_i):** 4 Nepers (N)
- **Maximum Control Grid Resistor (R_{g1}):**
 - **Automatic Bias:** 1 M Ω
 - **Fixed Bias:** 0.5 M Ω

Calculation Note: The voltage gain is specified as 4 Nepers. Converting this unit to decibels yields a voltage gain of approximately 34.74 dB (calculated as $4 \text{ N} \times 8.686 \text{ dB/N}$).

As an Output Valve

When used as an output stage, the operating voltages and currents remain identical to the pre-amplifier configuration, but the grid resistor limits are tightened to prevent thermal runaway under power conditions, and the power output is specified:

- **Anode Voltage (V_a):** 200 V
- **Screen Grid Voltage ($V_{[g2]}$ (/tubes/G2)):** 200 V
- **Cathode Resistor (R_k):** 125 Ω
- **Anode Load Resistor (R_a):** 8 k Ω
- **Anode Current (I_a):** 35 mA
- **Screen Grid Current ($I_{[g2]}$ (/tubes/G2)):** 4.6 mA
- **Mutual Conductance (S):** 8 mA/V
- **Internal Resistance (R_i):** 50 k Ω
- **Output Power (W_o):** 0.8 W
- **Total Distortion (d_{tot}):** < 3%
- **Maximum Control Grid Resistor (R_{g1}):**
 - **Automatic Bias:** 0.3 M Ω
 - **Fixed Bias:** 0.15 M Ω

Absolute Maximum Ratings

The absolute maximum ratings define the safe operating envelope of the 18014. Exceeding these limits may cause permanent damage or severely degrade the tube's lifespan.

Parameter	Absolute Maximum Value
Cold Anode Voltage (V_{a0})	450 V
Anode Voltage (V_a)	220 V
Anode Dissipation (W_a)	7 W
Cold Screen Grid Voltage (V_{g20})	450 V
Screen Grid Voltage ($V_{g2}(/tubes/G2)$)	220 V
Screen Grid Dissipation ($W_{g2}(/tubes/G2)$)	1 W
Cathode Current (I_k)	50 mA
Grid Current Start (V_{g1} at $I_{g1} = +0.3 \mu\text{A}$)	-1.3 V
Heater-to-Cathode Voltage (V_{fk})	50 V
Heater-to-Cathode Resistance (R_{fk})	3 k Ω

Technical Summary

The **18014** is a specialized, high-reliability pentode designed for telephone equipment applications. Operating with a 4 V, 1.6 A heater, it provides a mutual conductance of 8 mA/V and an internal resistance of 50 k Ω at its typical 200 V operating point. It is highly versatile, serving as a pre-amplifier with a gain of 4 Nepers (~34.7 dB) or as an output valve delivering 0.8 W of power with less than 3% total distortion. With its metallized shield and low feedback capacitance (< 0.6 pF), the 18014 ensures stable and low-noise performance in demanding telecommunication circuits.



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 · Pentode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode Voltage	200 V	—
Screen Voltage	200 V	—
Anode Current	35 mA	—
Screen Current	4.6 mA	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1963 Philips Electron Tubes Handbook V1

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

1963 PHILIPS ELECTRON TUBES HANDBOOK V1

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	200 V	TelephoneAmplifier
Screen voltage	200 V	TelephoneAmplifier
Cathode resistor	125 ohm	TelephoneAmplifier
Plate current	35 mA	TelephoneAmplifier
Screen current	4.6 mA	TelephoneAmplifier

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Output power	0.8 W	OutputValve

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transconductance	8000 uS	—
Plate resistance	0.05 MOhm	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode capacitance	13 pF	—
Control-grid capacitance	15 pF	—
Anode-to-control-grid capacitance	0.6 pF	Maximum where stated
Control-grid-to-heater capacitance	2 pF	Maximum where stated



SOURCE DATA APPENDIX

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 · Pentode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	50000 ohm	Typical
Transconductance	8000 μS	Typical

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate voltage	220 V	Maximum
Maximum screen voltage	220 V	Maximum

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