



ELECTRONIC TUBE REFERENCE

14K7

Voltage - Triode (with diode, heptode or hexode) electronic tube

CONSOLIDATED TECHNICAL
DATA

2 SECTIONS
CONSTRUCTION
HEXODE-TRIODE

Triode-hexode frequency converter for superheterodyne receivers. The triode serves as local oscillator while the remote-cutoff hexode performs mixing, combining oscillator and converter functions with high output resistance for good circuit isolation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	LOCTAL	BASE PINS	8
NOMINAL HEATER	14 V / 150 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Hexode	
PLATE RESISTANCE	1000000 Ω
TRANSCONDUCTANCE	0.00075 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	1.5 W
MAXIMUM SCREEN DISSIPATION	0.3 W
MAXIMUM CATHODE CURRENT	7 mA
<i>Conversion transconductance promoted.</i>	

SECTION2 Triode	
TRANSCONDUCTANCE	0.0028 S
AMPLIFICATION FACTOR	22
MAXIMUM PLATE VOLTAGE	175 V
MAXIMUM PLATE DISSIPATION	0.8 W
MAXIMUM CATHODE CURRENT	6 mA

14K7 — Triode-Hexode Converter

An indirectly heated multi-unit vacuum tube containing a triode and a remote cut-off hexode, designed for frequency converter and mixer applications in radio receivers.

Overview

The **14K7** is a multi-unit frequency converter tube manufactured by N.V. Philips' Gloeilampenfabrieken. It combines a triode section and a hexode section within a single glass envelope. The hexode section is designed with remote cut-off characteristics, allowing for effective automatic gain control (AGC) or automatic volume control (AVC) without introducing significant distortion. In typical receiver designs, the triode section operates as the local oscillator, while the hexode section functions as the mixer/converter.

Physical Specifications and Basing

The 14K7 is constructed with a glass bulb and an **E8-30** base. It can be mounted and operated in any position.

The physical dimensions of the device are:

- **Maximum overall length:** 2-3/8 inches (60 mm)
- **Maximum seated height:** 2-1/16 inches (53 mm)
- **Maximum diameter:** 7/8 inches (22 mm)

The tube utilizes the **8GY** basing arrangement. The pin connections, viewed from the underside of the base, are as follows:

Pin	Connection
Pin 1	Heater
Pin 2	Hexode Plate
Pin 3	Triode Plate
Pin 4	Hexode Grid No. 3, Triode Grid (internally connected)

Pin	Connection
Pin 5	Hexode Grids No. 2 & No. 4
Pin 6	Hexode Grid No. 1
Pin 7	Cathode
Pin 8	Heater

The internal connection between the hexode's third grid (Grid No. 3) and the triode's control grid on Pin 4 simplifies circuit layout by directly injecting the local oscillator signal into the mixing structure of the hexode.

Heater and Cathode Ratings

The 14K7 features a coated unipotential cathode shared between both the triode and hexode sections. The heater is designed for series or parallel operation with the following nominal electrical ratings:

- **Heater Voltage:** 14 V
- **Heater Current:** 0.1 A

To prevent insulation breakdown and ensure reliable operation, the potential difference and resistance between the heater and cathode must be kept within the following limits:

- **Maximum voltage between heater and cathode:** 150 V
- **Maximum external resistance between heater and cathode:** 20,000 Ω

Electrical Characteristics and Operating Points

The electrical characteristics of the 14K7 are specified separately for the hexode and triode sections under typical operating conditions.

Hexode Section (Mixer/Converter)

Under typical operating conditions, the hexode section exhibits the following characteristics:

- **Plate Voltage:** 200 V
- **Grids No. 2 & No. 4 (Screen Grids) Voltage:** 85 V
- **Grid No. 1 (Control Grid) Voltage:** -2.0 V
- **Plate Current:** 3.0 mA
- **Grids No. 2 & No. 4 Current:** 3.0 mA
- **Conversion Transconductance:** 750 μmhos
- **Plate Resistance:** $>1.0 \text{ M}\Omega$
- **Remote Cut-off Bias:** A Grid No. 1 bias of -27.5 V reduces the conversion transconductance to 7.5 μmhos .

Triode Section (Oscillator)

The triode section operates with the following typical characteristics:

- **Plate Voltage:** 100 V
- **Grid Voltage:** 0 V
- **Plate Current:** 10 mA
- **Transconductance:** 2,800 μmhos
- **Amplification Factor (μ):** 22

Maximum Ratings

The maximum ratings for the 14K7 are defined under the design centre rating system. These limits must not be exceeded to maintain tube longevity and performance.

Hexode Section Ratings

- **Maximum Plate Supply Voltage:** 550 V
- **Maximum Plate Voltage:** 250 V
- **Maximum Plate Dissipation:** 1.5 W
- **Maximum Grids No. 2 & No. 4 Supply Voltage:** 550 V
- **Maximum Grids No. 2 & No. 4 Voltage (Plate current = 3 mA):** 125 V
- **Maximum Grids No. 2 & No. 4 Voltage (Plate current < 1 mA):** 250 V
- **Maximum Grids No. 2 & No. 4 Dissipation:** 0.3 W
- **Maximum Cathode Current:** 7 mA
- **Maximum Grid No. 1 Circuit Resistance:** 3 M
- **Maximum Grid No. 3 Circuit Resistance:** 3 M

Triode Section Ratings

- **Maximum Plate Supply Voltage:** 550 V
- **Maximum Plate Voltage:** 175 V
- **Maximum Plate Dissipation:** 0.8 W
- **Maximum Cathode Current:** 6.0 mA
- **Maximum Grid Circuit Resistance:** 3 M

Electrode Capacitances

The interelectrode capacitances of the 14K7 determine its performance at high frequencies. The capacitances are detailed below for both sections and between the sections:

Inter-Section Capacitances

- **Hexode Grid No. 1 to Triode Grid:** <0.35 μF

- **Hexode Plate to Triode Grid:** $<0.2 \mu\text{F}$

Hexode Section Capacitances

- **Input Capacitance:** $3.8 \mu\text{F}$
- **Output Capacitance:** $9.2 \mu\text{F}$
- **Plate to Grid No. 1 Capacitance:** $<0.1 \mu\text{F}$
- **Grid No. 1 to Heater Capacitance:** $<0.15 \mu\text{F}$

Triode Section Capacitances

- **Input Capacitance:** $5.5 \mu\text{F}$
- **Output Capacitance:** $2.3 \mu\text{F}$
- **Plate to Grid Capacitance:** $1.2 \mu\text{F}$

Analysis of Characteristic Curves

The operational behavior of the 14K7 is further illustrated by its characteristic curves, which detail the relationships between electrode voltages, currents, and transconductance.

Triode Section Curves

The triode section's plate family curves show plate current plotted against plate voltage for grid bias values ranging from 0 V down to -12 V in 2 V increments. At a grid bias of 0 V, the plate current rises rapidly with plate voltage, reaching approximately 10 mA at 100 V and exceeding 20 mA as the plate voltage approaches 150 V.

Additionally, at a fixed plate voltage of 100 V, the transconductance and plate current curves plotted against grid bias demonstrate that both parameters fall smoothly as the grid bias becomes more negative. The transconductance starts at 2,800 μmhos at 0 V bias and approaches zero near -10 V, while the plate current drops from 10 mA to zero over the same bias range.

Hexode Section Curves

The hexode section curves illustrate the remote cut-off characteristics of the mixer. Plate current and transconductance are plotted against Grid No. 1 bias for plate voltages between 170 V and 200 V, under typical oscillator conditions (oscillator grid leak of 47,000, and an oscillator grid current of 200 μA).

Curves are provided for various fixed Grids No. 2 and 4 voltages (40 V, 70 V, 100 V, 130 V, and 160 V), as well as for supply configurations using a potentiometer network (18,000, + 27,000,) at supply voltages of 170 V and 200 V. These curves demonstrate that the transconductance decreases gradually from around 750–1000 μmhos at low bias values down to approximately 1 μmho at a Grid No. 1 bias of -40 V. This extended, smooth cut-off characteristic allows the tube to handle a wide range of input signal levels without cross-modulation or distortion when AGC voltage is applied.

Technical Summary

The **14K7** is an **E8-30 based, indirectly heated triode-hexode converter** featuring a **14 V, 0.1 A heater** and a **shared cathode**. It is designed for frequency conversion and mixing applications in radio receivers. The hexode section provides a remote cut-off characteristic with a conversion transconductance of **750 μmhos** at a plate voltage of **200 V** and screen voltage of **85 V**, which can be controlled down to **7.5 μmhos** at a bias of **-27.5 V**. The triode section serves as a local oscillator, featuring an amplification factor of **22** and a transconductance of **2,800 μmhos** at a plate voltage of **100 V**. With its internal connection between the triode grid and hexode Grid No. 3, the 14K7 offers an integrated, space-saving solution for superheterodyne receiver designs.

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 · Hexode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	200 V	—
Screen voltage	85 V	—
Plate current	3 mA	—
Screen current	3 mA	—
Conversion transconductance	750 μ S	—
Plate resistance	1000000 ohm	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-heater capacitance maximum	0.15 pF	—

1999 PHILIPS 0-D

Section 2 · Triode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	100 V	—
Plate current	10 mA	—
Transconductance	2800 μ S	—
Amplification factor	22	—

TUBE TINKER

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

