

ELECTRONIC TUBE REFERENCE

1805

Rectifier - Full Wave electronic tube

CONSOLIDATED TECHNICAL DATA
2 SECTIONS
CONSTRUCTION
RECTIFIER-RECTIFIER

Philips directly heated full-wave high-vacuum rectifier for receiver and general power-supply service. Its dual-anode arrangement provides moderate-current full-wave rectification from a conventional four-volt filament.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	4 V / 1 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Rectifier	
PEAK INVERSE VOLTAGE	1000 V
NOMINAL OUTPUT CURRENT	60 mA
Directly heated full-wave high-vacuum rectifier.	

SECTION2 Rectifier	
PEAK INVERSE VOLTAGE	1000 V
NOMINAL OUTPUT CURRENT	60 mA
Second physical rectifier section added for documented full-wave construction.	

1805 — Full-Wave High-Vacuum Rectifier

A directly heated, full-wave high-vacuum rectifier designed for A.C. mains receivers, providing reliable high-voltage rectification with flexible operating limits.

Overview

The **1805** is a high-vacuum rectifier tube designed primarily for full-wave rectification in A.C. mains radio receivers. It features a directly heated filament and is housed in a glass envelope. While primarily documented and utilized as a full-wave (biplate) rectifier, historical variants also outline its application in half-wave (monoplate) configurations.

The tube is engineered to deliver rectified direct current to receiver circuits, with its maximum current output dynamically rated based on the applied alternating current (A.C.) transformer voltage. At its maximum rated input voltage of $2 \times 500 \text{ V}_{\text{eff}}$, it can safely deliver a continuous D.C. output of 60 mA .

Mechanical Specifications and Base Pinout

The 1805 is constructed with a glass envelope and is fitted with either an A35 base (with an S III connection reference) or a standard 4-pin base. The physical dimensions of the tube vary slightly depending on the manufacturing era and envelope design:

- **Maximum Overall Length/Height (excluding pins):** 110 mm to 116 mm
- **Maximum Bulb Diameter:** 48 mm to 53 mm
- **Pin Length:** Maximum 18 mm

The pin connections for the 4-pin base configuration, viewed from the bottom of the tube, are assigned as follows:

Pin Number	Electrode Connection	Symbol
Pin 1	Anode 1	a'
Pin 2	Filament	f
Pin 3	Filament	f
Pin 4	Anode 2	a

Filament Ratings

The 1805 utilizes a directly heated filament designed for parallel supply from an alternating current (A.C.) source. The electrical requirements for the filament are:

- **Filament Voltage (V_f):** 4.0 V
- **Filament Current (I_f):** Approximately 1.0 A
- **Heating Method:** Direct, A.C. parallel supply

Because the filament is directly heated, the filament supply also serves as the electrical connection point for the positive D.C. output of the rectifier circuit.

Operating Characteristics and Limiting Values

The maximum permissible rectified output current (I_O) of the 1805 is inversely related to the applied secondary transformer voltage (V_{tr}). Operating the tube at lower transformer voltages allows for higher current delivery without exceeding the thermal and emission limits of the structure.

The standard operating limits and maximum ratings are structured as follows:

Transformer Voltage (V_{tr})	Maximum Rectified Current (I_O)
$2 \times 300 \text{ V}_{\text{eff}}$	100 mA
$2 \times 400 \text{ V}_{\text{eff}}$	75 mA
$2 \times 500 \text{ V}_{\text{eff}}$	60 mA

Historical Variant Ratings

Depending on the specific production date and variant, different maximum ratings were established:

- Full-Wave Variant (Late 1933):** Rated for a maximum A.C. anode voltage of $2 \times 300 \text{ V}$ with a maximum rectified current of 100 mA.
- Full-Wave Variant (Mid 1933):** Rated for a maximum A.C. anode voltage of $2 \times 400 \text{ V}$ with a maximum rectified current of 75 mA.
- Half-Wave Variant (Mid 1933):** Documented with a maximum A.C. anode voltage of $2 \times 300 \text{ V}$ and a maximum rectified current of 100 mA.

Performance Curves and Rectification Characteristics

Anode Conduction Characteristics

The relationship between individual anode current (I_a) and anode voltage (V_a) shows a smooth diode conduction curve starting at 0 V. The internal resistance of the diode determines the voltage drop across the tube during conduction. Two distinct sets of curve measurements describe this behavior:

- First Characteristic Set:**
 - At $V_a \approx 37 \text{ V}$, the anode current reaches 40 mA.
 - At $V_a \approx 70 \text{ V}$, the anode current reaches 100 mA.
 - At $V_a \approx 90 \text{ V}$, the anode current reaches 140 mA.
- Second Characteristic Set:**
 - At $V_a = 60 \text{ V}$, the anode current is approximately 50 mA.
 - At $V_a = 80 \text{ V}$, the anode current is approximately 70 mA.
 - Above 70 mA, the characteristic transitions to a dashed line, indicating peak or non-continuous operation, reaching 140 mA at $V_a \approx 140 \text{ V}$.

Rectification and Output Voltage Drop

When operating in a practical rectifier circuit with a filter capacitor ($C = 16\ \mu\text{F}$), the output voltage (V_O) drops as the load current (I_O) increases. This drop is heavily influenced by the total protective source resistance (R_t) of the transformer circuit.

The following output voltage behaviors are observed across different transformer voltages and source resistances ($R_t = 100\ \Omega$, $200\ \Omega$, $400\ \Omega$, and $800\ \Omega$):

- **At $V_{tr} = 2 \times 500\ \text{V}_{\text{eff}}$:**
 - The no-load voltage ($I_O = 0\ \text{mA}$) is approximately 700 V.
 - At the maximum rated load of $I_O = 60\ \text{mA}$, the output voltage (V_O) drops to approximately 610 V with a low source resistance ($R_t = 100\ \Omega$), and down to approximately 540 V (or 530 V in alternative curve sets) with a high source resistance ($R_t = 800\ \Omega$).
- **At $V_{tr} = 2 \times 400\ \text{V}_{\text{eff}}$:**
 - The no-load voltage ($I_O = 0\ \text{mA}$) is approximately 560 V.
 - At a load of $I_O = 75\ \text{mA}$, the output voltage ranges from approximately 470 V ($R_t = 100\ \Omega$) down to approximately 410 V ($R_t = 800\ \Omega$). Under a 60 mA load, the output voltage is approximately 400 V.
- **At $V_{tr} = 2 \times 300\ \text{V}_{\text{eff}}$:**
 - The no-load voltage ($I_O = 0\ \text{mA}$) is approximately 420 V.
 - At the maximum rated load of $I_O = 100\ \text{mA}$, the output voltage ranges from approximately 320 V ($R_t = 100\ \Omega$) down to approximately 260 V ($R_t = 800\ \Omega$). Under a 60 mA load, the output voltage is approximately 270 V.

These curves demonstrate that higher source resistance (R_t) and higher load current (I_O) result in a predictable and significant voltage drop, which must be accounted for when designing the power supply filter network.

Technical Summary

The **1805** is a classic directly heated, high-vacuum full-wave rectifier designed for A.C. mains receivers. Operating with a standard **4.0 V, 1.0 A** filament supply, it provides reliable high-voltage D.C. conversion. The tube is highly adaptable, offering a maximum output of **100 mA** at $2 \times 300\ \text{V}_{\text{eff}}$, **75 mA** at $2 \times 400\ \text{V}_{\text{eff}}$, and **60 mA** at its maximum input rating of $2 \times 500\ \text{V}_{\text{eff}}$. Its physical construction utilizes an A35 or 4-pin base, making it a standard component for mid-20th-century receiver power supplies.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1938 Philips Miniwatt Vacuum Tube Catalog

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

1938 PHILIPS MINIWATT VACUUM TUBE CATALOG

Section 1 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum AC no-load voltage per plate	500 V	FullWave
Maximum DC output current	60 mA	FullWave

1938 PHILIPS MINIWATT VACUUM TUBE CATALOG

Section 2 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum AC no-load voltage per plate	500 V	FullWave
Maximum DC output current	60 mA	FullWave

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 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Rectified Output Current	100 mA	—
Peak/AC Input Voltage	1000 V	Source table

1957 PHILIPS RECEIVING AND AMPLIFYING TUBES

Section 2 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Rectified Output Current	100 mA	—
Peak/AC Input Voltage	1000 V	Source table



SOURCE DATA APPENDIX

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 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum AC no-load voltage per plate	500 V	FullWave
Maximum DC output current	60 mA	FullWave

1963 PHILIPS ELECTRON TUBES HANDBOOK V1

Section 2 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum AC no-load voltage per plate	500 V	FullWave

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum DC output current	60 mA	FullWave



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 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	40 V	Nominal
Heater current	500 mA	Nominal
Rectified current	30 mA	Maximum

1999 PHILIPS 0-D

Section 2 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	40 V	Nominal
Heater current	500 mA	Nominal
Rectified current	30 mA	Maximum

TUBE TINKER

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