

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
RECTIFIER

1110

Rectifier - Half Wave electronic tube

Directly heated Philips gas-filled industrial rectifier for charging lead-acid batteries. Rated for approximately 185 V peak inverse voltage, 850 mA average current, and 5 A peak current.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	1.9 V / 3.5 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Rectifier	
PEAK INVERSE VOLTAGE	185 V
NOMINAL OUTPUT CURRENT	850 mA
PEAK FORWARD CURRENT	5 A
FORWARD VOLTAGE DROP	9 V
WARM-UP TIME	15 s
Directly heated gas-filled rectifier for battery charging up to 20 lead-acid cells.	

1110 — Gas-Filled Double-Anode Rectifying Valve

The **1110** is a gas-filled, double-anode rectifying tube designed primarily for low-voltage battery charging applications. Manufactured with an oxide-coated filament, this directly heated valve is engineered to deliver efficient rectification in battery chargers, supporting charging currents up to 2 A per valve and configurations of up to 20 lead-acid (Pb) cells.

Construction, Physical Specifications, and Base

The 1110 features a robust glass envelope containing two independent anodes and a shared directly heated filament. The physical dimensions and mechanical specifications of the tube are as follows:

- **Maximum Bulb Diameter:** 39 mm
- **Maximum Seated Height:** 113 mm
- **Maximum Overall Length:** 131 mm
- **Net Weight:** 55 g
- **Shipping Weight (per 100 valves):** 7100 g

Mounting and Socketing

To ensure stable operation and proper distribution of the gas fill during conduction, the tube must be mounted in a **vertical, base down** position. It utilizes a specialized **Type A base** and requires a **Type 40465 socket** for electrical connection. The pinout configuration includes connections for the filament (f, f) and both anodes (a, a').

Filament and Heating Characteristics

The 1110 is equipped with a directly heated, oxide-coated filament. The filament supply must be alternating current (A.C.) with the following nominal ratings:

Parameter	Value
Filament Voltage (V_f)	1.9 V
Filament Current (I_f)	3.5 A
Recommended Pre-heating Time (T_w)	15 s

The recommended pre-heating time of 15 seconds allows the filament to reach its proper operating temperature before anode current is drawn. In urgent circumstances, this pre-heating period may be decreased to 0 seconds.

Electrical and Typical Characteristics

As a gas-filled device, the 1110 exhibits a low and relatively constant voltage drop during conduction, which contributes to its high efficiency in low-voltage rectification. Its typical characteristics are defined by:

- **Arc Voltage (V_{arc}):** 9 V (the typical voltage drop across the tube during conduction)
- **Ignition Voltage (V_{ign}):** 16 V (the minimum anode voltage required to initiate ionization and start conduction)

Operating Characteristics in Battery Charging Service

In a typical full-wave rectification circuit (designated as circuit "a"), operating with a transformer secondary voltage (V_{tr}) of **60 V_{eff}** (RMS) and a series limiting resistance (R_t) of **8 Ω** , the tube's performance varies dynamically with the state of charge of the connected battery bank:

Battery State	Battery Voltage (V_{bat})	Output Current (I_O)	Peak Anode Current (I_{ap})
Discharged	36 V	2.0 A	—
Nominal	44 V	1.4 A	3.8 A
Charged	54 V	0.85 A	—

Current Regulation with a Barretter

When a barretter (current regulator) is incorporated into the charging circuit, the nominal charging current (I_O) can be increased from its standard nominal value of 1.4 A up to **2.0 A**. This allows for a more rapid and constant charging profile.

Limiting Values (Absolute Maximum System)

To prevent damage to the oxide-coated filament and ensure the integrity of the gas fill, the operating conditions must be kept within the following absolute limits:

- **Maximum Peak Inverse Anode Voltage (V_{ainvp}):** 185 V
- **Maximum Average Anode Current (I_a):** 0.85 A
- **Maximum Peak Anode Current (I_{ap}):** 5.0 A
- **Minimum Series Resistance (R_t):** 4 Ω
- **Ambient Temperature Range (t_{amb}):** -55 °C to +75 °C

The minimum series resistance (R_t) of 4 Ω is a critical safety parameter required to limit the peak anode current and protect the tube from excessive current surges during startup or transient conditions.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1963 Philips Electron Tubes Handbook V3

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

1963 PHILIPS ELECTRON TUBES HANDBOOK V3

Section 1 · Rectifier

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Arc voltage drop	9 V	GasFilled

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum peak inverse anode voltage	185 V	—
Maximum average anode current	850 mA	—
Maximum peak anode current	5 A	—
Application	battery charging up to 20 lead-acid cells	—
Heater voltage	1.9 V	DirectAC
Heater current	3.5 A	DirectAC



SOURCE OPERATING CONDITIONS

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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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MinimumSeriesResistance	4 ohm	—
NominalBatteryVoltage	44 V	BatteryCharger
NominalOutputCurrent	1.4 A	BatteryCharger

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
TypicalArcVoltage	9 V	—

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