



ELECTRONIC TUBE REFERENCE

1054

Rectifier - Half Wave electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

RECTIFIER

Directly heated Philips mercury-vapour or gas-filled industrial rectifier for welding power supplies. Rated for approximately 150 V peak inverse voltage, 20 A average current, and 120 A peak current.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	1.9 V / 68 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Rectifier	
PEAK INVERSE VOLTAGE	150 V
NOMINAL OUTPUT CURRENT	20 A
PEAK FORWARD CURRENT	120 A
FORWARD VOLTAGE DROP	9 V
WARM-UP TIME	120 s
Directly heated gas-filled rectifier with mercury-vapour/gas filling for welding rectifier service.	

1054 — Double-Anode Mercury-Vapour and Gas-Filled Rectifying Valve

A heavy-duty, directly heated industrial rectifying valve designed for low-voltage, high-current applications such as welding rectifiers.

Overview

The **1054** is a specialized double-anode industrial rectifying valve containing a combined mercury-vapour and gas filling. Engineered primarily for high-current service, its primary documented application is in welding rectifiers, where a single valve is rated to deliver a rectified output of **40 A**. The tube features a robust directly heated oxide-coated filament, two top-mounted anode terminals, and a heavy-duty physical construction designed to withstand demanding industrial environments.

Mechanical Design and Physical Dimensions

The 1054 is characterized by a large glass envelope with a rugged base and heavy-duty terminal connections. The physical layout is optimized for high-current dissipation and secure mounting in industrial cabinets.

- **Mounting Position:** The valve must be mounted strictly in a **vertical position, base down**. This orientation is critical to ensure proper distribution of the liquid mercury and correct condensation during operation.
- **Anode Connections:** The two anodes (*a* and *a'*) terminate at the top of the bulb via heavy-duty threaded **M6** connectors, spaced **33 mm** apart. This top-cap configuration isolates the high-current anode lines from the filament wiring.
- **Filament Connections:** The filament terminals (*f* and *f*) are located at the base of the tube to accommodate the high-current supply lines.
- **Weight:** The device has a net weight of **950 g**, reflecting its substantial internal electrodes and heavy glass construction. For transport, it is typically packaged with a shipping weight of **3200 g**.

Dimensional Specifications

The physical dimensions of the 1054 are detailed below:

Dimension Parameter	Value
Overall Height	330–350 mm
Seated Height (Body)	240 ± 4 mm
Maximum Bulb Diameter	111 mm
Base Diameter	99 mm
Total Bracket Width	145 mm
Mounting Hole Spacing	125 mm
Mounting Hole Width	10 mm
Bracket Thickness	3.5 mm

Filament and Preheating Requirements

The 1054 utilizes a directly heated, oxide-coated filament designed for operation from an AC supply. Due to the high current requirements, the filament parameters must be tightly controlled.

- **Filament Voltage (V_f):** 1.9 V
- **Filament Current (I_f):** 68 A
- **Calculated Filament Power:** $1.9\text{ V} \times 68\text{ A} = 129.2\text{ W}$

Preheating Protocol (T_w)

Because the valve contains mercury vapour, a strict preheating protocol must be observed before anode voltage is applied. This ensures that the mercury vaporizes and reaches the correct operating pressure, preventing damage to the oxide-coated cathode from ion bombardment.

- **Recommended Preheating Time (T_w):** **2 minutes** under normal operating conditions.
- **Minimum Preheating Time:** In urgent circumstances, the preheating time may be reduced to a minimum of **1 minute**. To ensure this delay is reliably maintained, the use of an external time-delay switch (such as type **4152**) is recommended.
- **Post-Transport / Long Interruption Delay:** After transport or following a prolonged interruption of service, the preheating time must be extended to at least **5 minutes** to completely clear mercury deposits from the electrodes.

Electrical Characteristics and Operating Limits

The 1054 operates with a low internal voltage drop, characteristic of mercury-vapour and gas-filled rectifiers, which ensures high efficiency in low-voltage, high-current power supplies.

Typical Characteristics

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

Limiting Values (Absolute Maximum Ratings)

The operating limits of the 1054 must be strictly respected to prevent arc-back or premature cathode degradation.

Parameter	Limit Value	Conditions / Notes
Transformer Voltage (V_{tr}), Maximum	$48 V_{eff}$	Under specified circuit conditions (Circuit a)
Transformer Voltage (V_{tr}), Minimum	$20 V_{eff}$	Under specified circuit conditions (Circuit a)

Parameter	Limit Value	Conditions / Notes
Peak Inverse Anode Voltage (V_{ainvp})	max. 150 V	Maximum transient reverse voltage
Average Anode Current (I_a)	max. 20 A	Per anode
Peak Anode Current (I_{ap})	max. 120 A	Maximum repetitive surge current
Surge Limiting Resistance (R_t)	min. 0.18 Ω	Minimum resistance in series with each anode
Condensed Mercury Temperature (t_{Hg})	30–80 °C	Safe operating temperature range

The minimum surge limiting resistance ($R_t = 0.18 \Omega$) is a critical safety parameter. It limits the peak current during turn-on or transient conditions, protecting the cathode from exceeding its absolute maximum peak rating of **120 A**. Additionally, the condensed mercury temperature (t_{Hg}) must be kept within the **30–80 °C** window; temperatures below this range will increase the ignition voltage and tube drop, while temperatures above this range significantly lower the peak inverse voltage capability, risking destructive arc-back.

Technical Summary

The **1054** is a heavy-duty, double-anode, mercury-vapour and gas-filled rectifying valve designed for high-current industrial applications, most notably in **40 A welding rectifiers**. It features a low-voltage, high-current directly heated filament operating at **1.9 V / 68 A** (representing a calculated power consumption of **129.2 W**). The tube is physically robust, weighing **950 g**, and requires vertical mounting with the base down.

Electrically, the 1054 is characterized by a low arc drop of **9 V** and an ignition voltage of **16 V**. It supports a maximum peak inverse voltage of **150 V**, a maximum average anode current of **20 A** per anode, and a peak anode current of **120 A**. Safe operation requires strict adherence to a **2-minute preheating delay** (extendable to **5 minutes** after transport) and maintaining the condensed mercury temperature between **30 °C and 80 °C**.



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	150 V	—
Maximum average anode current	20 A	—
Maximum peak anode current	120 A	—
Application	welding rectifier service	—
Heater voltage	1.9 V	DirectAC
Heater current	68 A	DirectAC



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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MinimumSeriesResistance	0.18 ohm	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
TypicalArcVoltage	9 V	—
IgnitionVoltage	16 V	—

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