



ELECTRONIC TUBE REFERENCE

1543

Rectifier - Full Wave electronic tube

CONSOLIDATED TECHNICAL DATA

3 SECTIONS

CONSTRUCTION

RECTIFIER-RECTIFIER-RECTIFIER

Directly heated Philips three-anode mercury-vapor/gas industrial rectifier for heavy-current power conversion. Its large filament and multi-anode construction provide tens of amperes of rectified current.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	1.9 V / 36 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Common cathode	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Rectifier	
PEAK INVERSE VOLTAGE	850 V
NOMINAL OUTPUT CURRENT	25 A
PEAK FORWARD CURRENT	70 A
FORWARD VOLTAGE DROP	15 V
WARM-UP TIME	120 s
Representative of three identical anode rectifier paths; published I_a max 8.3 A per anode.	

SECTION2 Rectifier	
PEAK INVERSE VOLTAGE	850 V
NOMINAL OUTPUT CURRENT	25 A
PEAK FORWARD CURRENT	70 A
FORWARD VOLTAGE DROP	15 V
WARM-UP TIME	120 s
<i>Physical rectifier section 2; electrical properties populated from the same published ratings applicable to the identical rectifier path.</i>	

SECTION3 Rectifier	
PEAK INVERSE VOLTAGE	850 V
NOMINAL OUTPUT CURRENT	25 A
PEAK FORWARD CURRENT	70 A
FORWARD VOLTAGE DROP	15 V
WARM-UP TIME	120 s
<i>Physical rectifier section 3; electrical properties populated from the same published ratings applicable to the identical rectifier path.</i>	

1543 — Three-Anode Mercury-Vapour and Gas-Filled Rectifying Valve

A heavy-duty, directly heated industrial rectifying valve designed for high-current applications, including battery charging systems and industrial power supplies.

Overview

The **1543** is a specialized industrial rectifying valve featuring three independent anodes, utilizing a combination of mercury vapour and gas filling to achieve high efficiency and high current capability. It is primarily designed for industrial rectifier applications, such as charging lead-acid battery installations containing up to 110 cells (Pb-cells), where it can deliver a maximum continuous output of 25 A per valve.

The tube's design combines a low internal arc voltage drop with robust construction to handle substantial peak and average currents. It incorporates an auxiliary ignition electrode to facilitate reliable starting under various load conditions.

Filament and Heating Requirements

The 1543 utilizes a directly heated, oxide-coated filament designed to operate from an AC supply. Because of the high emission currents required for industrial service, the filament demands a low voltage but a

very high current.

Filament Parameter	Value
Nominal filament voltage (V_f)	1.9 V
Nominal filament current (I_f)	36 A
Calculated filament power consumption	68.4 W
Heating supply type	AC (direct)
Cathode type	Oxide-coated filament

Pre-heating and Delay Requirements

Due to the mercury-vapour filling, strict timing rules must be observed for the filament pre-heating time (T_w) before anode voltage is applied:

- **Standard Operation:** A minimum pre-heating time of **2 minutes** is recommended to allow the filament to reach stable operating temperature.
- **Urgent Operation:** Under urgent circumstances, this delay may be decreased to a minimum of **1 minute**.
- **Post-Transport or Long Interruption:** After transport or a prolonged period out of service, the pre-heating time must be extended to at least **5 minutes** ($T_w = 5$ minutes) to ensure that any condensed mercury is completely vaporized from the electrode structures.

To automate and safeguard this pre-heating cycle, the use of a specialized time delay switch (such as type [4152](#)) is recommended.

Mechanical Design and Physical Dimensions

The 1543 is a physically large and heavy valve, designed to be mounted exclusively in a **vertical position with the base down** to ensure proper distribution and containment of the liquid mercury.

Physical Specifications

- **Net Weight:** 725 g
- **Shipping Weight:** 2800 g
- **Maximum Overall Height:** 265 mm
- **Maximum Width (including side terminals):** 170 mm
- **Maximum Bulb Diameter:** 84 mm

Electrode Connections and Terminals

- **Anode Terminals:** The three main anodes are terminated at the top and sides of the bulb. The top anode terminal features a maximum diameter of 42 mm and is fitted with an M6 screw connection.

The side anode terminals are fitted with M4 screw connections.

- **Base Connections:** The bottom base contains the heavy-duty filament connections (f, f) and the connection for the auxiliary ignition electrode (a_h).

Electrical Characteristics and Auxiliary Ignition

The gas and mercury-vapour filling provides a highly stable and low internal voltage drop during conduction, which minimizes internal power dissipation and maximizes rectifier efficiency.

Typical Operating Characteristics

- **Arc Voltage Drop (V_{arc}):** 15 V
- **Ignition Voltage (V_{ign}):** 50 V

Auxiliary Ignition Circuit

To reliably initiate the arc at the specified ignition voltage of 50 V, an auxiliary DC supply unit must be connected to the auxiliary ignition electrode (a_h). This auxiliary supply must deliver approximately **100 V DC** at a current of **25 mA**.

The positive terminal of this auxiliary supply is connected to the auxiliary ignition electrode (a_h), and the negative terminal is connected to the cathode (-). A current-limiting resistor must be placed in series with this circuit to protect the ignition electrode. The Philips Auxiliary Ignition Unit type E3 108 03 is recommended for this purpose.

Limiting Values and Operating Ranges

To ensure reliable operation and prevent backfiring or premature cathode degradation, the operating conditions must be maintained within the following absolute limits:

Parameter	Minimum	Maximum
Transformer secondary voltage (V_{tr})*	60 V_{eff}	275 V_{eff}
Peak inverse anode voltage (V_{ainvp})	—	850 V
Average anode current (I_a , per anode)	—	8.3 A
Peak anode current (I_{ap})	—	70 A
Surge-limiting resistance (R_t)	0.4 Ω	—
Mercury temperature range (t_{Hg})	30 °C	80 °C

**Note: The transformer voltage limits (V_{tr}) are specified for a standard three-phase rectifier configuration (Circuit c).*

The maximum average anode current of 8.3 A per anode allows the three-anode valve to deliver a combined continuous DC output of approximately 25 A ($3 \times 8.3 \text{ A} = 24.9 \text{ A}$), matching its nominal industrial rating. The minimum surge – limiting resistance (R_t) of 0.4Ω per anode must be present in the circuit to limit transient currents during startup or load fluctuations. The operating temperature of the mercury condensed at the bottom of the envelope must be kept strictly between 30 °C and 80 °C to maintain the correct vapour pressure inside the bulb.

Technical Summary

The **1543** is a robust, three-anode, mercury-vapour and gas-filled industrial rectifying valve. It features a directly heated, oxide-coated filament operating at **1.9 V / 36 A** and is capable of delivering up to **25 A** of continuous rectified current (with a limit of **8.3 A average per anode** and **70 A peak**). Designed for vertical mounting, it exhibits a low arc voltage drop of **15 V** and utilizes an auxiliary ignition electrode requiring a **100 V / 25 mA** DC supply to achieve reliable ignition at **50 V**. With a peak inverse voltage rating of **850 V**, the 1543 is highly suited for high-power industrial battery chargers and DC distribution systems.

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
Maximum RMS anode supply voltage	275 V	—
Minimum RMS anode supply voltage	60 V	—
Maximum average anode current per anode	8.3 A	—
Minimum series resistance	0.4 ohm	—
Permitted mercury/ambient temperature	30–80 degC	—
DC output current	25 A	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ignition voltage	50 V	—

1999 PHILIPS 0-D

Section 2 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum RMS anode supply voltage	275 V	—
Maximum RMS anode supply voltage	275 V	—
Minimum RMS anode supply voltage	60 V	—
Minimum RMS anode supply voltage	60 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum average anode current per anode	8.3 A	—
Maximum average anode current per anode	8.3 A	—
Minimum series resistance	0.4 ohm	—
Minimum series resistance	0.4 ohm	—
Permitted mercury/ambient temperature	30–80 degC	—
Permitted mercury/ambient temperature	30–80 degC	—
DC output current	25 A	—
DC output current	25 A	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ignition voltage	50 V	—
Ignition voltage	50 V	—

1999 PHILIPS 0-D

Section 3 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum RMS anode supply voltage	275 V	—
Maximum RMS anode supply voltage	275 V	—
Minimum RMS anode supply voltage	60 V	—
Minimum RMS anode supply voltage	60 V	—
Maximum average anode current per anode	8.3 A	—
Maximum average anode current per anode	8.3 A	—
Minimum series resistance	0.4 ohm	—
Minimum series resistance	0.4 ohm	—
Permitted mercury/ambient temperature	30–80 degC	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DC output current	25 A	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ignition voltage	50 V	—

TUBE TINKER

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

[Catalog](#) [Tube types](#) [Full books](#) [Blog](#) [Feedback & corrections](#)

© 2026 Tube Tinker