



ELECTRONIC TUBE REFERENCE

1553

Rectifier - Full Wave electronic tube

CONSOLIDATED TECHNICAL DATA

3 SECTIONS

CONSTRUCTION

RECTIFIER-RECTIFIER-RECTIFIER

Directly heated Philips three-anode mercury-vapor/gas industrial rectifier with auxiliary ignition. Its heavy filament and multi-anode construction provide very high current for industrial power conversion.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	1.9 V / 70 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	40 A
PEAK FORWARD CURRENT	135 A
FORWARD VOLTAGE DROP	15 V
WARM-UP TIME	120 s
Representative of three identical anode rectifier paths; published I_a max 13.3 A per anode.	

SECTION2 Rectifier	
PEAK INVERSE VOLTAGE	850 V
NOMINAL OUTPUT CURRENT	40 A
PEAK FORWARD CURRENT	135 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	40 A
PEAK FORWARD CURRENT	135 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>	

1553 — Three-Anode Industrial Rectifying Valve

The **1553** is a heavy-duty, three-anode, mercury-vapour and gas-filled rectifying valve designed for industrial power applications. It is primarily employed in industrial rectifier systems, capable of delivering up to 40 A per valve, and is rated for charging up to 110 lead-acid (Pb) cells. The tube features a directly heated, oxide-coated filament and requires vertical mounting with the base down.

Construction and Physical Characteristics

The 1553 is a physically large and robust industrial tube. It features a glass envelope with multiple external terminals to accommodate high currents and high-voltage isolation.

- Envelope and Terminals:** The tube has three main anode connections (labeled a , a' , and a'') and an auxiliary ignition electrode (labeled a_h). The filament connections (f , f) are located at the base.
- Dimensions:**
 - Maximum overall height: 327 ± 5 mm
 - Maximum bulb diameter: 124 mm
 - Maximum width across side terminals: 297 mm
 - Top cap diameter: Maximum 52 mm
- Weight:**
 - Net weight: 1550 g

- Shipping weight: 5150 g
- **Mounting Position:** The valve must be mounted strictly in a vertical position with the base down.

Filament and Heating Requirements

The 1553 utilizes a directly heated, oxide-coated filament designed for high-current operation. Due to the mercury-vapour filling, strict preheating times must be observed before anode voltage is applied to prevent damage to the cathode.

Parameter	Value
Filament Voltage (V_f)	1.9 V
Filament Current (I_f)	70 A
Heating Method	Direct (A.C.)
Recommended Preheating Time (T_w)	2 minutes

Preheating and Delay Considerations

The recommended preheating time (T_w) is 2 minutes. Under urgent operating conditions, this delay may be reduced to a minimum of 1 minute. To ensure the correct delay is maintained, the use of a time delay switch (such as the Philips type [4152](#)) is recommended.

Following transport or after a long interruption of service, the preheating time must be extended to a minimum of 5 minutes ($T_w = 5$ minutes) to ensure that any condensed mercury is completely vaporized from the electrode structures before applying anode voltage.

Electrical Characteristics and Auxiliary Ignition

The 1553 operates with a low internal arc voltage drop, which is characteristic of mercury-vapour and gas-filled rectifiers, ensuring high efficiency.

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

Auxiliary Ignition Circuit

To reliably achieve the required 50 V ignition voltage, an auxiliary D.C. supply unit must be connected to the tube. This auxiliary supply should deliver approximately 100 V with a current capability of 25 mA. It must be connected via a current-limiting resistor between the auxiliary ignition electrode (ah , positive terminal) and the cathode (negative terminal). The Philips Auxiliary Ignition Unit type E3 108 03 is recommended for this purpose.

Limiting Values and Operating Conditions

The operation of the 1553 is governed by strict maximum and minimum limits to ensure reliable service and prevent premature failure.

Parameter	Limit Value
Transformer Voltage (V_{tr})	Max. 275 V_{eff} / Min. 60 V_{eff}
Peak Inverse Anode Voltage ($V_{a\ inv\ p}$)	Max. 850 V
Average Anode Current (I_a)	Max. 13.3 A
Peak Anode Current (I_{ap})	Max. 135 A
Minimum Surge Limiting Resistance (R_t)	Min. 0.25 Ω
Operating Mercury Temperature (t_{Hg})	30 °C to 80 °C

The transformer voltage limits (V_{tr}) of 60 to 275 V_{eff} apply under specific circuit configurations (referred to as Circuit c). The minimum surge limiting resistance (R_t) of 0.25 Ω is required to protect the tube from excessive peak currents during start-up or transient conditions. The condensed mercury temperature (t_{Hg}) must be maintained within the range of 30 °C to 80 °C during operation to ensure proper vapor pressure and prevent arc-back or cathode sputtering.

Technical Summary

The **1553** is a three-anode, mercury-vapour and gas-filled industrial rectifying valve. It features a directly heated, oxide-coated filament operating at 1.9 V and a very high current of 70 A. Designed for heavy-duty industrial rectifiers, it can support up to 40 A per valve and charge up to 110 lead-acid cells. The tube requires a vertical, base-down mounting position, a preheating delay of 2 minutes (extendable to 5 minutes after transport), and an auxiliary ignition supply of 100 V / 25 mA connected to its ignition electrode. With a peak inverse voltage rating of 850 V and a peak anode current rating of 135 A, the 1553 is engineered for robust, high-efficiency industrial power rectification.

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	13.3 A	—
Minimum series resistance	0.25 ohm	—
Permitted mercury/ambient temperature	30–80 degC	—
DC output current	40 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	13.3 A	—
Maximum average anode current per anode	13.3 A	—
Minimum series resistance	0.25 ohm	—
Minimum series resistance	0.25 ohm	—
Permitted mercury/ambient temperature	30–80 degC	—
Permitted mercury/ambient temperature	30–80 degC	—
DC output current	40 A	—
DC output current	40 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	13.3 A	—
Maximum average anode current per anode	13.3 A	—
Minimum series resistance	0.25 ohm	—
Minimum series resistance	0.25 ohm	—
Permitted mercury/ambient temperature	30–80 degC	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DC output current	40 A	—

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

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