

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

1177

1 SECTION
CONSTRUCTION
RECTIFIER

Rectifier - Half Wave electronic tube

Directly heated Philips mercury-vapour or gas-filled industrial rectifier for very-high-current battery-charging installations up to about 110 lead-acid cells. Rated for approximately 850 V peak inverse voltage and 25 A output.

GENERAL CHARACTERISTICS

BASE DESIGNATION	SPECIAL	BASE PINS	—
NOMINAL HEATER	1.9 V / 45 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Rectifier	
PEAK INVERSE VOLTAGE	850 V
NOMINAL OUTPUT CURRENT	25 A
PEAK FORWARD CURRENT	135 A
FORWARD VOLTAGE DROP	12 V
WARM-UP TIME	120 s
Directly heated gas-filled rectifier with mercury-vapour/gas filling for industrial rectifier service up to 110 lead-acid cells.	

1177 — Single-Anode Mercury-Vapour and Gas-Filled Rectifying Valve

An industrial-grade, directly heated, single-anode rectifying valve filled with mercury vapour and gas, designed for high-current power rectification and battery charging applications.

Overview

The **1177** is a heavy-duty, single-anode rectifying valve containing a combination of mercury vapour and gas filling. It is designed specifically for industrial rectification systems, such as charging large lead-acid battery installations up to a maximum of 110 series-connected cells (Pb-accumulators), or providing high-current DC power for industrial machinery. The valve is rated to deliver a maximum of 25 A of average anode current, and its gas-mercury filling ensures a low internal voltage drop and high operating efficiency under heavy loads.

Mechanical Construction and Physical Dimensions

The physical design of the 1177 is optimized for high-current handling, thermal dissipation, and high-voltage isolation. The valve is housed in a large glass bulb with a body diameter of 125 mm. The maximum overall width, including the auxiliary ignition electrode terminal protruding from the side, is 145 mm, while the maximum diameter at the upper collar is 128 mm. The total height of the valve ranges from 342 mm to 362 mm.

Electrical connections are distributed across the envelope to prevent arc-over and ensure low contact resistance:

- **Anode (a):** Located at the top of the envelope, terminated with an M8 threaded post to secure heavy-gauge anode cabling.
- **Auxiliary Ignition Electrode (ah):** Positioned on the side of the bulb, terminated with an M4 threaded post.
- **Filament (f, f):** Connected via heavy, flexible leads at the base of the valve to accommodate the high filament current.

The valve must be mounted in a **vertical, base-down** position to ensure the proper distribution of the liquid mercury and gas mixture during operation. The net weight of the device is 1060 g, and its shipping weight is 2720 g.

Filament and Heating Requirements

The 1177 utilizes a directly heated, oxide-coated filament. Due to the high emission requirements of the cathode, the filament operates at a very low voltage but requires a substantial current:

Filament Parameter	Value
Filament Voltage (V_f)	1.9 V
Filament Current (I_f)	60 A
Calculated Filament Power	114 W
Heating Supply	AC

Before anode voltage is applied, the filament must be preheated to establish the correct mercury-vapour pressure and prevent damage to the oxide coating. The recommended preheating time (T_w) is **2**

minutes. In urgent circumstances, this preheating period may be reduced to a minimum of **1 minute**. To automate this startup sequence, a time delay switch (such as type [4152](#)) can be integrated into the control circuitry. Following transport or a prolonged interruption of service, a longer preheating period of **5 minutes** is mandatory to ensure all liquid mercury is vaporized from the electrodes.

Ignition and Auxiliary Circuitry

During normal conduction, the 1177 exhibits a low typical arc voltage drop (V_{arc}) of **12 V**. The required ignition voltage (V_{ign}) to initiate the arc is documented between **22 V and 28 V**.

To reliably achieve this ignition voltage, an auxiliary DC supply unit must be connected to the auxiliary ignition electrode "ah" (+) and the cathode (-). This auxiliary supply must deliver a minimum of **40 V** and a current of at least **10 mA**. A current-limiting resistor must be placed in series with the auxiliary electrode to protect the ignition circuit. An auxiliary ignition unit (such as type 1289) is recommended to satisfy these requirements.

Operating Characteristics

The 1177 can be configured in various rectifier circuits to deliver different output voltages and currents. The operating characteristics for several standard circuit configurations (designated a through g) are detailed below:

Circuit Configuration	Transformer Voltage (V_{tr} , V_{eff})	Output Voltage (V_o , V)	Output Current (I_o , A)
a	275	230	50
b	540	440	50
c	220	240	75
d	210	440	75
e	205	240	100
f	200	250	150
g	220	240	150

Absolute Maximum Ratings

The 1177 has two distinct sets of absolute maximum ratings (limiting values) depending on the operating temperature ranges and electrical stresses. Operating the valve beyond these limits can cause backfiring, cathode damage, or premature failure.

Parameter	Rating Set 1	Rating Set 2
Max. Peak Inverse Anode Voltage (V_{ainvp})	685 V	850 V
Max. Average Anode Current (I_a , $T_{av} = \text{max. } 5 \text{ s}$)	25 A	25 A
Max. Peak Anode Current (I_{ap})	150 A	135 A
Max. Surge Anode Current (I_{surge} , $T = \text{max. } 0.1 \text{ s}$)	1500 A	1250 A
Min. Series Resistance (R_t)	0.1 Ω	0.1 Ω
Mercury Temperature Range (t_{Hg})	30 to 80 °C	30 to 75 °C
Ambient Temperature Range (t_{amb})	10 to 50 °C	10 to 45 °C

The series resistance (R_t) represents the minimum protective resistance required in the anode circuit to limit surge currents during faults or transient conditions.

Technical Summary

The **1177** is an industrial-grade, single-anode, mercury-vapour and gas-filled rectifying valve. It features a directly heated, oxide-coated filament operating at **1.9 V / 60 A** (requiring 114 W of heating power) and must be operated in a vertical, base-down position. The valve is characterized by a low arc voltage drop of **12 V** and requires an auxiliary DC ignition supply of at least **40 V / 10 mA** connected to its side-mounted auxiliary electrode to achieve reliable ignition. Depending on the thermal environment and circuit configuration, the 1177 can withstand peak inverse voltages up to **850 V** and deliver average currents of **25 A** per valve, making it a robust solution for high-power industrial rectification and battery charging systems.



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	12 V	GasFilled

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum peak inverse anode voltage	850 V	—
Maximum average anode current	25 A	—
Maximum peak anode current	135 A	—
Maximum surge current	1250 A	ShortDuration
Application	industrial rectifier service up to 110 lead-acid cells	—
Heater voltage	1.9 V	DirectAC
Heater current	45 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

CONSTRUCTION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Filling	Mercury vapour and gas	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Arc voltage	12 V	—
Ignition voltage	28 V	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak inverse voltage	850 V	—

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