



ELECTRONIC TUBE REFERENCE

1859

Rectifier - Half Wave electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

RECTIFIER

Philips directly heated mercury-vapor/gas high-current cinema rectifier, providing approximately 25 A DC and exceptionally high peak-current capability for industrial supplies.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	1.9 V / 60 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Rectifier	
PEAK INVERSE VOLTAGE	360 V
NOMINAL OUTPUT CURRENT	25 A
PEAK FORWARD CURRENT	150 A
FORWARD VOLTAGE DROP	12 V
WARM-UP TIME	2 s
<i>Promoted only where the locked section schema has a direct semantic match; additional published device-specific ratings, operating points, capacitances, life-test, pulse, RF, and rectifier data are retained in TUBE_SECTION_PARAMETER.</i>	

1859 — Double-Anode Mercury Vapour and Gas-Filled Rectifying Valve

The **1859** is a heavy-duty, double-anode rectifying valve filled with mercury vapour and gas. Designed primarily for high-current applications such as cinema rectifiers, it is capable of delivering up to 50 A per

valve. The device features an oxide-coated, directly heated filament operating at a very low voltage and extremely high current.

Mechanical Design and Physical Specifications

The 1859 is a physically large valve, constructed with a robust glass bulb and heavy-duty threaded terminals to handle high currents.

- **Mounting Position:** Must be mounted vertically, base down.
- **Dimensions:** Maximum diameter of 143 mm and a maximum height of 436 mm.
- **Weight:** Net weight is 1650 g, with a shipping weight of 3800 g.
- **Terminals:**
 - **Top Caps:** Two M8 threaded terminals with 50 mm spacing, serving as the connections for the two anodes (a, a').
 - **Base:** M4 threaded terminals for the auxiliary ignition electrode (ah) and the filament/cathode connections (f, f).

Filament and Pre-heating Requirements

The 1859 utilizes an oxide-coated filament designed for direct heating via an alternating current (A.C.) supply. Due to the high thermal mass and the mercury-vapour filling, strict pre-heating schedules must be observed to prevent damage to the cathode during ignition.

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

Pre-heating Schedule

- **Standard Operation:** A recommended pre-heating time (T_w) of 2 minutes is required before applying anode voltage. In urgent situations, this delay can be reduced to a minimum of 1 minute. A time delay switch (such as type [4152](#)) can be used to automate this delay.
- **Commissioning and Maintenance:** After transport or a long period of service interruption, the valve must be pre-heated for at least 5 minutes to ensure proper distribution of the mercury vapour before drawing current.

Electrical and Ignition Characteristics

The 1859 exhibits a low internal voltage drop typical of gas and mercury-vapour rectifiers.

- **Arc Voltage (V_{arc}):** 12 V (typical operating voltage drop across the valve during conduction).
- **Ignition Voltage (V_{ign}):** 28 V.

Auxiliary Ignition System

To reliably initiate conduction at an ignition voltage of 28 V, the 1859 requires an auxiliary ignition circuit. An auxiliary D.C. supply delivering a minimum of 40 V and 10 mA must be connected between the auxiliary ignition electrode (a_h , positive terminal) and the cathode (negative terminal). This connection must be made via a current-limiting resistor to protect the ignition electrode. The Philips Auxiliary Ignition Unit type 1289 is recommended for this purpose.

Operating Configurations

The 1859 can be operated in several circuit configurations to deliver varying output voltages (V_O) and currents (I_O) from an effective transformer secondary voltage (V_{tr}).

Circuit Configuration	Transformer Voltage (V_{tr})	Output Voltage (V_O)	Output Current (I_O)
a	115 V_{eff}	85 V	50 A
e	115 V_{eff}	120 V	100 A
f	105 V_{eff}	120 V	150 A
g	115 V_{eff}	110 V	150 A

Absolute Maximum Ratings

To ensure the longevity and safe operation of the mercury-vapour and gas-filled envelope, the following absolute limits must not be exceeded:

- **Peak Inverse Anode Voltage (V_{ainvp}):** Maximum 360 V.
- **Average Anode Current (I_a):** Maximum 25 A per anode, calculated over a maximum averaging time (T_{av}) of 15 seconds.
- **Peak Anode Current (I_{ap}):** Maximum 150 A.
- **Surge Current (I_{surge}):** Maximum 1250 A for a maximum duration (T) of 0.1 seconds (intended as a safety rating for short-circuit or fault conditions).
- **Minimum Series Resistance (R_t):** Minimum 0.1 Ω must be present in the anode circuit to limit peak currents.
- **Mercury Temperature (t_{Hg}):** The operating temperature of the mercury condensed at the bottom of the bulb must be maintained strictly between 30 °C and 80 °C.

Technical Summary

The **1859** is a high-power, double-anode, mercury-vapour and gas-filled rectifying valve designed for demanding industrial and cinema projection applications. Operating with a high-current 1.9 V, 60 A filament, it requires careful pre-heating and an auxiliary D.C. ignition supply to establish its low-loss 12 V

arc. With a peak inverse voltage rating of 360 V and the capability to support output currents up to 150 A in multi-valve configurations, the 1859 provides a highly efficient and robust solution for heavy-duty D.C. power rectification, provided its strict thermal and electrical limits are maintained.

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
Filament heating time	2 s	IndustrialRectifier
Arc voltage drop	12 V	IndustrialRectifier
Ignition voltage	28 V	IndustrialRectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak inverse anode voltage maximum	360 V	IndustrialRectifier
Average anode current maximum	25 A	IndustrialRectifier
Peak anode current maximum	150 A	IndustrialRectifier
Surge current maximum	1250 A	IndustrialRectifier
Recommended temperature range	30-80 °C	IndustrialRectifier
Transformer RMS voltage	115 V	CircuitA
DC output voltage	85 V	CircuitA
DC output current	50 A	CircuitA
Transformer RMS voltage	115 V	CircuitE
DC output voltage	120 V	CircuitE
DC output current	100 A	CircuitE
Transformer RMS voltage	105 V	CircuitF
DC output voltage	120 V	CircuitF
DC output current	150 A	CircuitF

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transformer RMS voltage	115 V	CircuitG
DC output voltage	110 V	CircuitG
DC output current	150 A	CircuitG

TUBE TINKER

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