



ELECTRONIC TUBE REFERENCE

1738

Rectifier - Half Wave electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
RECTIFIER

Philips directly heated mercury-vapor/gas half-wave rectifier for charging lead-acid batteries, providing several amperes of DC output with high peak-current capability.

GENERAL CHARACTERISTICS

BASE DESIGNATION	GOLIATH	BASE PINS	—
NOMINAL HEATER	1.925 V / 18 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Common cathode	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Rectifier	
PEAK INVERSE VOLTAGE	300 V
NOMINAL OUTPUT CURRENT	7.5 A
PEAK FORWARD CURRENT	45 A
FORWARD VOLTAGE DROP	9 V
WARM-UP TIME	120 s
<i>Published ratings and characteristics promoted from the approved TESLA source.</i>	

1738 — Gas-Filled Double-Anode Rectifying Valve

The **1738** is a robust, mercury-vapour and gas-filled full-wave rectifying valve designed for highly stressed industrial equipment and battery charging applications. Featuring a double-anode configuration and an oxide-coated, directly heated filament, this tube is engineered to deliver high rectified currents under demanding operating conditions.

Mechanical Construction and Base Connections

The 1738 is constructed with a specialized glass bulb designed to withstand high thermal and electrical stress. It is designed strictly for vertical mounting in a base-down position.

The physical dimensions and mechanical specifications of the tube are as follows:

- **Maximum Diameter:** 92 mm to 94 mm
- **Maximum Height:** 284 mm to 290 mm
- **Net Weight:** 370 g
- **Shipping Weight:** 3000 g

The electrical connections are distributed across the envelope to ensure adequate isolation between high-voltage and low-voltage elements:

- **Base:** Cemented "Goliath" screw base (E40/45) used for the filament connections.
- **Socket:** Compatible with the 65909 BG/01 socket.
- **Anode Connections:** Two terminals (M6 top caps) located at the top of the bulb.
- **Screen / Auxiliary Ignition Electrode (S_{zap}):** Brought out to a separate lower side terminal (M4, maximum 13 mm). This screen must be connected to the cathode via a 10 k Ω , 0.5 W resistor.

Filament Ratings and Pre-Heating Requirements

The 1738 features a directly heated, oxide-coated cathode designed for operation from an AC supply. Due to the mercury-vapour fill, strict pre-heating and conditioning protocols must be observed to prevent damage to the cathode and avoid electrical breakdown.

Parameter	Value / Requirement
Filament Voltage (V_f / U_f)	1.9 V to 1.95 V
Filament Current (I_f)	Approx. 18 A (at mean filament voltage)
Recommended Pre-heating Time (T_w)	2 minutes (can be reduced to 1 minute if urgent; a type 4152 time delay switch may be used)
Pre-heating Time after Transport/Interruption	5 minutes

Conditioning and Burn-in Procedure

Before placing a new or long-stored tube into active service, a formal burn-in (Zahoření) procedure is required. The tube must be pre-heated by sequentially connecting each anode for 15 minutes. This process ensures that any dispersed mercury within the envelope condenses in the lower part of the bulb, mitigating the risk of arc-back or breakdown between the anodes during operation.

Electrical Characteristics and Operating Limits

The 1738 operates as a low-voltage, high-current rectifier. Its electrical performance is characterized by low internal voltage drops once the gas arc is ignited.

Typical Characteristics

- **Arc Voltage** ($V_{arc} / U_{arc\ max}$): 9 V typical, with a maximum limit of 12.5 V.
- **Ignition Voltage** ($V_{ign} / U_{zap\ max}$): 20 V typical, with a maximum limit of 25 V.
- **Rectified Current** (I_{ss}): 15 A.

Maximum Ratings and Limiting Values

To ensure reliable operation and prevent premature failure, the circuit design must adhere to the following absolute limits:

- **Transformer Voltage** (V_{tr} / E_a): Maximum 95 Veff (RMS), Minimum 20 Veff (RMS) per anode.
- **Peak Inverse Anode Voltage** ($V_{ainvp} / E_{inv\ max}$): Maximum 270 V to 300 V.
- **Anode Current** (I_a): Maximum 7.5 A.
- **Peak Anode Current** ($I_{ap} / I_{ss\ max}$): Maximum 45 A.
- **Surge Limiting / Minimum Protective Resistance** ($R_t / R_{a\ min}$): Minimum 0.2 Ω per anode (applied at the highest anode voltage).
- **Operating Mercury Temperature** (t_{Hg}): 30 to 80 °C.

Applications and Circuit Implementation

The primary application of the 1738 is in high-current rectification systems. It is highly suited for:

- **Battery Chargers:** Capable of delivering 15 A per valve, suitable for charging up to 36 lead-acid (Pb) cells, or up to 40 lead-acid / 60 alkaline cells in industrial configurations.
- **Industrial Power Supplies:** Used to power electromagnetic clamping plates, DC motors, arc lamps, and electrochemical processes.

In all applications, the auxiliary ignition electrode (screen) must be connected to the cathode through the specified 10 k Ω , 0.5 W resistor to ensure reliable ignition and stable operation.

Related Designations and Equivalents

Several designations share electrical or mechanical similarities with the 1738, though direct substitution may require modifications:

- **1039, N 110/10, and R 1029:** These types are equivalent to the 1738 but require mechanical or electrical modifications.
- **1838:** This type is equivalent under the specific condition that the AC supply voltage does not exceed a maximum of 2 x 90 Veff.

Technical Summary

The **1738** is a heavy-duty, mercury-vapour and gas-filled full-wave rectifier tube featuring a Goliath base, dual top-cap anode connections, and a directly heated 1.9 V / 18 A filament. Capable of delivering a rectified current of 15 A (with peak currents up to 45 A) and operating at transformer voltages up to 95 Veff per anode, it is a standard choice for industrial battery chargers and DC power systems. Proper thermal management (maintaining mercury temperature between 30 and 80 °C) and strict adherence to pre-heating and burn-in protocols are essential to ensure the tube's operational longevity.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X Tesla

Published test conditions and operating points. Values on this page are preserved as reported by this source.

195X TESLA

Section 1 · Rectifier

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
RectifiedCurrent	15 A	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak Inverse Voltage	270 V	—
PeakRectifiedCurrent	45 A	—



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	300 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum average anode current	7.5 A	—
Maximum peak anode current	45 A	—
Application	battery charging up to 36 lead-acid cells	—
Heater voltage	1.9 V	DirectAC
Heater current	18 A	DirectAC



SOURCE DATA APPENDIX

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	95 V	—
Minimum RMS anode supply voltage	20 V	—
Maximum average anode current per anode	7.5 A	—
Minimum series resistance	0.2 ohm	—
Permitted mercury/ambient temperature	30–80 degC	—
DC output current	15 A	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ignition voltage	20 V	—

TUBE TINKER

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

