



ELECTRONIC TUBE REFERENCE

148

Rectifier - Half Wave electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
RECTIFIER

Machlett high-vacuum rectifier for very-high-voltage supplies, voltage multipliers, and capacitor-energy-storage circuits, providing approximately 150 kV inverse-voltage capability with oil insulation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	5.7 V / 6.6 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Rectifier	
MAXIMUM PLATE DISSIPATION	60 W
PEAK INVERSE VOLTAGE	150000 V
PEAK FORWARD CURRENT	1 A
FORWARD VOLTAGE DROP	500 V
WARM-UP TIME	2 s
<i>Promoted fields populated from explicitly published ratings/characteristics; service-specific data retained as parameters.</i>	

148 - High-Vacuum Rectifier Tube

The **ML-148** is a high-vacuum rectifier tube designed specifically for high-power-level applications. It is characterized by its high peak power capability, making it highly suitable for use in voltage multiplier circuits, energy storage capacitor circuits, and other demanding power applications. The tube is engineered to provide ruggedness, a long operational life, low internal voltage drop, and a high average load current capacity.

Construction and Mechanical Specifications

The ML-148 incorporates specialized design features to ensure reliable operation under high electrostatic and thermal stress:

- **Cathode:** The tube features a low-wattage, thoriated-tungsten, catenary-type filament. This design allows for close anode-to-cathode spacing without the risk of filament distortion caused by electrostatic forces.
- **Anode:** A cylindrical molybdenum anode is utilized, providing a high rate of heat dissipation and offering an adequate safety factor against accidental thermal overload.
- **Cooling and Insulation:** The tube is cooled via radiation. It is designed to operate in either air or oil insulating mediums, which directly affects its maximum voltage ratings.

The physical dimensions and mechanical properties of the ML-148 include:

- **Mounting Position:** Optional (can be mounted in any orientation).
- **Net Weight:** 16 ounces.
- **Overall Length:** 10-1/2 inches (with a tolerance of +/- 1/16 inch).
- **Bulb Diameter:** The center section of the tube has a diameter of 2-1/2 inches.
- **End Caps:** The end caps have a diameter of 2-1/4 inches. The longer end cap measures 3-1/8 inches in length with a terminal pin that is 1 inch in diameter and 11/16 inch long. The shorter end cap measures 2 inches in length with a terminal pin that is 1/2 inch in diameter and 1/2 inch long.

Electrical Characteristics and Filament Ratings

The electrical parameters of the filament must be precisely maintained to ensure the longevity of the thoriated-tungsten cathode.

- **Filament Voltage:** 5.7 Volts. The applied filament voltage must be held within +/- 5% of this rated value under all operating conditions to maximize the tube's life.
- **Filament Current:** Approximately 6.6 Amperes at the rated voltage of 5.7 Volts.
- **Filament Heating Time:** A minimum of 2 seconds must be allowed for the filament to heat before anode voltage is applied.
- **Tube Voltage Drop:** The maximum tube voltage drop is 800 Volts when the anode current is at 1.0 Ampere.

Filament Power Calculation

- **Input Voltage:** 5.7 V
- **Input Current:** 6.6 A
- **Calculation:** $5.7 \text{ V} \times 6.6 \text{ A} = 37.62 \text{ Watts}$ of nominal filament power.

Maximum Ratings and Circuit Applications

The maximum ratings of the ML-148 depend heavily on the insulating medium used and the specific circuit configuration.

Voltage and Current Limits

- **Peak Inverse Anode Voltage (Oil Insulation):** 150,000 Volts (150 PKV)
- **Peak Inverse Anode Voltage (Air Insulation):** 80,000 Volts (80 PKV)
- **Peak Anode Current:** 1.0 Ampere
- **Anode Dissipation:** 60 Watts

Average D-C Load Current Ratings

The allowable average direct-current load depends on the rectifier circuit configuration and whether the circuit is filtered or unfiltered:

Circuit Application	Unfiltered Load Current	Filtered Load Current
Single-phase, two-tube, half-wave	0.150 Amp	—
Single-phase, four-tube, full-wave	0.300 Amp	0.320 Amp
Three-phase, double-Y parallel	0.900 Amp	0.900 Amp
Three-phase, full-wave	0.450 Amp	0.450 Amp

Note on operating conditions: Unfiltered load current ratings are based on a sine-wave input and a resistive load without any inductive or capacitive effects. Filtered load current ratings are based on a sine-wave voltage input and an inductive choke input filter.

Anode Current Characteristics

The relationship between the peak anode current and the peak anode voltage (at the nominal filament voltage of 5.7 V) demonstrates the tube's conduction characteristics:

- At low anode voltages, such as 200 V, the peak anode current is minimal, remaining under 100 mA.
- As the anode voltage increases, the current rises in a non-linear fashion. It reaches approximately 500 mA at a peak anode voltage of 600 V.
- At approximately 850 V, the current reaches the rated peak anode current of 1.0 Ampere (1000 mA).
- The curve continues upward, showing that the tube can conduct up to approximately 1.6 Amperes (1600 mA) when the peak anode voltage reaches 1200 V, though operational designs must respect the 1.0 Ampere maximum peak anode current rating.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 Machlette Laboratories

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

1971 MACHLETTE LABORATORIES

Section 1 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
The ML	148	The ML-148 is a high-vacuum rectifier tube having a high-power-level applications. These features insure rug-
maximum inverse voltage rating of	150 mA	maximum inverse voltage rating of 150 PKV using oil gedness, long life, low internal voltage drop and high aver-
insulation or	80 mA	insulation or 80 PKV using air insulation and a maximum age-load-current capacity. The cathode is a low-wattage,
peak anode current rating of	1	peak anode current rating of 1.0 ampere. It is especially thoriated-tungsten, catenary-type filament, allowing close
Filament Voltage	5.7 V	Filament Voltage 5.7 Volts*
Filament Current at [1]	5.7 V	Filament Current at 5.7 Volts, approximate 6.6 Amps
Filament Current at [2]	6.6 V	Filament Current at 5.7 Volts, approximate 6.6 Amps
Filament Heating Time, minimum	2 s	Filament Heating Time, minimum 2 Secs
* Applied filament voltage must be held within =	59 mA	* Applied filament voltage must be held within = 59 of rated voltage. For maximum life, ilament voltage should be main-
Peak Anode Current . I	1	Peak Anode Current . I 1.0 Amp
Anode Dissipation	60	Anode Dissipation 60 Warts
Published value	1	1+Unfiltered Load Current Ratings are basedon sine-wave inputandresistanceload wnthout inductive or capacitive effects.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Published value	1	1Filtered Load Current Ratings are based on sine-wave voltageinput and inductive chokeinput filter.