



ELECTRONIC TUBE REFERENCE

18514

Specialized - Radiation Counter electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

GEIGERMULLERCOUNTER

Large-area self-quenching mica-window Geiger-Müller counter for alpha and beta particles and low-energy photons. The enlarged sensitive window improves collection efficiency for weakly penetrating radiation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	— / —	PARALLEL HEATER	— / —
HEATING	Indirect; cold cathode	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 GeigerMullerCounter	
MAXIMUM PLATE VOLTAGE	600 V
<i>Published ratings and characteristics promoted semantically from the approved Philips source.</i>	

18514 — Self-Quenching Radiation Counter Tube

The **18514** is a self-quenching radiation counter tube designed for the detection of alpha particles, beta particles, and photons down to very low energy levels. Filled with a rare gas and featuring a thin mica window, the tube is utilized in laboratory, medical, and industrial tracer techniques, thickness measuring instruments, and general survey or laboratory monitoring equipment.

Mechanical Construction and Protection

The 18514 is constructed with a thin mica window at one end to permit the entry of low-energy ionizing radiation. The physical and mechanical specifications of the tube and its protective housing include:

- **Mica Window Diameter:** 27.8 mm
- **Mica Window Area:** 605 mm²
- **Mica Window Density:** 3.5 to 4 mg/cm² (uniform for each individual counter)
- **Cathode Wall Thickness:** 1.2 mm
- **Tube Weight:** 56 g (alone), 156 g (with container)
- **Tube Dimensions:** Maximum diameter of 30 mm, maximum length of 98 mm
- **Container Dimensions:** Maximum diameter of 54 mm, maximum length of 121 mm

The tube is delivered inside a protective aluminium container that is electrically connected to the cathode. For testing or for measuring gamma radiation and high-energy particles, the tube can remain inside this container. The container features a V-groove that can be cut through with a penknife to remove the counter when necessary. Additionally, a detachable rubber cap is supplied to protect the delicate mica window when the tube is not being used to measure low-energy radiation.

Electrical and Operating Characteristics

The electrical behavior of the 18514 is defined by its rare gas filling and physical geometry. The operating parameters under typical conditions are:

Parameter	Specification
Threshold Voltage	600 V
Plateau Length	300 V (minimum 200 V)
Plateau Slope (at 100 counts/sec)	0.06 %/V typical, 0.15 %/V maximum
Dead Time	250 to 100 µs (dependent on working voltage)
Maximum Counting Rate	6,000 counts/sec
Background (Shielded with 1/4" Al + 2" Pb)	Maximum 40 counts/min
Interelectrode Capacitance (Tube alone)	1 pF
Interelectrode Capacitance (In container)	5 pF

The dead time of the tube varies from 250 µs down to 100 µs depending on the applied working voltage. The background count is kept to a maximum of 40 counts per minute when the tube is shielded by a combination of 1/4-inch aluminium and 2-inch lead shielding.

Environmental and Life Ratings

The 18514 is rated for operation across a wide thermal range and exhibits a long operating life:

- **Ambient Temperature Range:** -55 °C to +75 °C
- **Count Life Expectancy:** Minimum 10¹⁰ counts

Detection Efficiency

The detection capabilities of the 18514 vary depending on the type of radiation and its incident energy:

- **Gamma and Radium Sensitivity:** When exposed to a radium source of $2.39 \pm 1\%$ millicurie, the tube produces a counting rate of 7,210 counts per minute for a radiation intensity of 2.5 m röntgen/hour.
- **Beta Particles:** The tube detects and counts all beta particles arriving at the mica window with an energy exceeding 50 keV. The actual counting rate is subject to the source type, geometry, and self-absorption factors.
- **Alpha Particles:** The stopping power of the mica window is equivalent to 3 cm of air. Alpha particles arriving at the window with an energy of approximately 5 MeV are successfully counted.

Circuit-Specific Operating Example

In a typical application circuit, the 18514 is integrated with an external amplifier stage. The cathode is grounded and connected to the protective aluminium container. The recommended circuit values are as follows:

- **Anode Series Resistor:** 2.7 M Ω (connected to the high-voltage HT+ supply)
- **Coupling Capacitor:** 300 pF
- **Grid Series Resistor:** 330 Ω (connected directly to the grid of the amplifier tube)
- **Grid Leak Resistor:** 1 M Ω

Technical Summary

The **18514** is a robust, rare-gas-filled, self-quenching radiation counter tube featuring a 27.8 mm diameter mica window. It is designed to detect alpha, beta, and gamma radiation across a temperature range of -55 °C to +75 °C with a minimum life expectancy of 10^{10} counts. Operating with a threshold voltage of 600 V and a plateau length of 300 V, the tube provides reliable radiation measurement capabilities in laboratory, medical, and industrial environments.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1957 Philips Receiving and Amplifying Tubes

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

1957 PHILIPS RECEIVING AND AMPLIFYING TUBES

Section 1 · GeigerMullerCounter

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Starting / Threshold Voltage Minimum	600 V	—
Plateau Length	300 V	—
Minimum Plateau Length	200 V	—
Plateau Slope Maximum	0.15 %/V	At published counting condition
Dead Time Maximum	250 us	—
Background Count Maximum	40 counts/min	Published shielding condition
Mica Window Area	605 mm ²	—
Count Life Expectancy Minimum	10000000000 counts	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Counting Rate	6000 counts/s	—
Maximum Ambient Temperature	75 C	—

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	Rare gas	—
Mica window diameter	27.8 mm	—
Mica window area	605 mm2	—
Mica window areal density	3.5-4 mg/cm2	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Interelectrode capacitance	1 pF	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plateau length	300 V	—
Plateau slope typical	0.06 %/V	At100CountsPerSecond
Plateau slope maximum	0.15 %/V	At100CountsPerSecond
Dead time minimum	100 usec	VoltageDependent
Dead time maximum	250 usec	VoltageDependent
Maximum counting rate	6000 counts/sec	—
Shielded background maximum	40 counts/min	1/4inAl;2inPb
Expected count life minimum	10000000000 counts	—

TUBE TINKER

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and their source documents.

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