



ELECTRONIC TUBE REFERENCE

18517

Specialized - Radiation Counter electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

GEIGERMULLERCOUNTER

Halogen-quenched Geiger-Müller anticoincidence guard counter designed to detect cosmic-ray background events so they can be rejected from simultaneous low-level radiation measurements.

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

SECTION1 GeigerMullerCounter

No fixed ratings recorded.

Gas-filled radiation-counter section; counter-specific electrical characteristics are retained in TUBE_SECTION_PARAMETER.

18517 — Halogen-Quenched Cosmic Ray Guard Counter Tube

A specialized gas-filled radiation detector designed for low-background measurements, operating as a guard tube in anticoincidence circuits.

Overview

The **18517** is a halogen-quenched cosmic ray guard counter tube. It is specifically engineered for low-background radiation measurement applications, where it typically functions as a guard tube in

anticoincidence configurations. In these setups, it is commonly paired with a beta counter, such as the type [18515](#), to detect and reject cosmic ray background events.

The tube utilizes a gas mixture of neon, argon, and a halogen quenching agent to ensure stable operation and self-quenching capability. It features a robust metal-and-glass construction with a dome base flange and flexible wire leads for electrical connection.

Mechanical Construction and Mounting

The 18517 is constructed with a heavy-duty envelope featuring a wall thickness of 1 mm. The cathode and anode structures are fabricated from an alloy consisting of 28% chromium and 72% iron.

Physical Dimensions and Weight

The physical envelope is characterized by a dome base flange and a top exhaust nipple. The key mechanical specifications are:

Parameter	Specification
Maximum Dome Flange Diameter	80 mm
Maximum Main Body Diameter	78 mm
Height to Flange	49–53 mm
Maximum Total Height	75 mm
Maximum Top Nipple Diameter	15 mm
Maximum Top Nipple Height	15 mm
Lead Length (Anode and Cathode)	30 mm
Weight	175 g

Mounting and Maintenance Requirements

Due to the high operating voltages and sensitive charge-collection characteristics of the tube, low-capacitance mounting is required. To prevent electrical leakage across the terminals, the tube must be kept dry and thoroughly cleaned.

Electrical and Operating Characteristics

At an ambient temperature of 25 °C, the 18517 exhibits highly stable plateau characteristics and low background counts when properly shielded.

Typical Operating Parameters

The standard operating point is defined with a recommended anode resistor (R) of 10 MΩ.

Parameter	Value	Conditions / Notes
Recommended Anode Resistor (R)	10 M Ω	Standard load
Starting Voltage (V_{ign})	550 V (min) – 650 V (max)	Threshold of discharge
Recommended Operating Voltage (V_b)	1000 V	Center of plateau
Plateau Range	800–1200 V	Region of stable count rate
Maximum Plateau Slope	0.03 %/V	Measured 800–1200 V at 50 counts/s, $R = 10 \text{ M}\Omega$
Maximum Dead Time	1 ms	Recovery period after discharge
Maximum Background Count Rate	75 counts/min	Shielded with 10 cm Fe (outer) and 5 cm Hg (inner)
Interelectrode Capacitance	5.5 pF	Anode-to-cathode capacitance

Recommended Circuit Configurations

The 18517 can be integrated into radiation detection systems using two primary circuit topologies, depending on whether it is used as a standalone detector or as an anticoincidence guard.

Standard Detector Circuit

In the standard configuration, the tube is biased through a series anode resistor, and the output signal is derived from the cathode:

- **Anode Connection:** Connected to the positive high-voltage supply ($+V_b$) via a 10 M Ω resistor (R).
- **Cathode Connection:** Connected to ground through a cathode resistor equal to one-tenth of the anode resistance ($1/10 R$).
- **Signal Output:** Taken from the junction between the cathode and the cathode resistor, decoupled through a suitable coupling capacitor.

The value of the cathode resistor is determined by calculation from the recommended anode resistor ($R = 10 \text{ M}\Omega$): Cathode Resistor = $\frac{1}{10} \times R = \frac{1}{10} \times 10 \text{ M}\Omega = 1 \text{ M}\Omega$

Anticoincidence Guard Circuit (with Type 18515)

When operating as a cosmic ray guard in conjunction with a type [18515](#) beta counter, the biasing arrangement is modified to optimize shielding performance:

- **Anode Connection:** Connected directly to the positive high-voltage supply ($+V_b$).

- **Cathode Connection:** Connected to ground through a series network consisting of a 10 MΩ resistor (R) and a 1 MΩ resistor ($1/10 R$).
- **Signal Output:** Taken from the junction between the 10 MΩ and 1 MΩ cathode resistors, decoupled through a coupling capacitor.

Environmental and Voltage Limits

To prevent damage and ensure reliable operation, the 18517 must be operated strictly within its absolute maximum ratings.

- **Maximum Anode Supply Voltage (V_b):** 1200 V (with a series resistance $R = 10 \text{ M}\Omega$).
- **Ambient Temperature Range (t_{amb}):** $-50 \text{ }^{\circ}\text{C}$ to $+75 \text{ }^{\circ}\text{C}$.

Performance Curves and Temperature Behavior

Starting Voltage vs. Temperature

The starting voltage (V_{ign}) of the 18517 is temperature-dependent and increases monotonically across its operating range. At the lower limit of $-50 \text{ }^{\circ}\text{C}$, the starting voltage is approximately 480 V. As the temperature rises to $0 \text{ }^{\circ}\text{C}$, V_{ign} increases to about 590 V, reaching approximately 610 V at the nominal room temperature of $25 \text{ }^{\circ}\text{C}$. If the temperature is increased further, the starting voltage continues its upward trend, reaching approximately 680 V at $+150 \text{ }^{\circ}\text{C}$.

Plateau Characteristics

When plotting the count rate against the applied anode voltage (V_a) with a 10 MΩ anode resistor, the tube exhibits a very flat plateau. This plateau begins near 800 V and extends up to 1200 V, maintaining a stable count rate of approximately 50 counts per second. When the anode voltage exceeds the absolute limit of 1200 V, the curve begins to bend upward, indicating the onset of continuous discharge or spurious pulsing.

Technical Summary

The **18517** is a specialized, halogen-quenched cosmic ray guard counter tube designed for low-background anticoincidence systems. Constructed with a 1 mm thick chromium-iron envelope and containing a neon-argon-halogen gas mixture, it provides a stable plateau from 800 V to 1200 V with a maximum slope of 0.03 %/V. Operating at a nominal voltage of 1000 V with a 10 MΩ anode resistor, the tube features a dead time of under 1 ms and a shielded background count rate of no more than 75 counts per minute. Its physical design, low interelectrode capacitance of 5.5 pF, and specific cathode-output circuit configurations make it highly optimized for integration with companion detectors like the type [18515](#).

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 · GeigerMullerCounter

CONSTRUCTION

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Filling	Neon, argon and halogen quenching agent	—

CAPACITANCE

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Interelectrode capacitance	5.5 pF	—

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Operating voltage	1000 V	—

CHARACTERISTICS

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plateau minimum	800 V	—
Plateau maximum	1200 V	—
Plateau slope maximum	0.03 %/V	—
Dead time maximum	1 msec	—
Background maximum	75 counts/min	—

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