

ELECTRONIC TUBE REFERENCE

18523

Specialized - Radiation Counter electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

GEIGERMULLERCOUNTER

Halogen-quenched mica-window Geiger-Müller counter for gamma and beta radiation. Its thin entrance window broadens beta sensitivity while retaining response to penetrating gamma 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

SECTION1 GeigerMullerCounter
No fixed ratings recorded.
Gas-filled radiation-counter section; counter-specific electrical characteristics are retained in TUBE_SECTION_PARAMETER.

18523 — Halogen-Quenched Radiation Counter Tube

The **18523** is a halogen-quenched radiation counter tube featuring a thin mica end window. It is designed for the detection and measurement of beta and gamma radiation. The tube utilizes a gas filling consisting of neon (Ne), argon (Ar), and a halogen quenching agent to facilitate stable Geiger-Müller operation.

Physical Construction and Dimensions

The 18523 is constructed with a robust metal-and-glass envelope designed to optimize radiation transmission through its end window while maintaining structural integrity.

Cathode and Window Specifications

The cathode is fabricated from an alloy consisting of 27% chromium and 73% iron. It is designed with the following physical parameters:

- **Wall Thickness:** 0.9 mm
- **Inside Diameter:** 24.1 mm
- **Effective Length:** 26 mm

The radiation-admitting end window is made of thin mica, allowing low-energy beta particles to penetrate the active volume. Its specifications include:

- **Thickness:** 1.5 to 2.5 mg/cm²
- **Effective Diameter:** 24.1 mm
- **Effective Area:** 455 mm²

Physical Dimensions and Weight

The physical envelope of the 18523 is compact, with a total weight of approximately 70 g. The external dimensions are tightly controlled:

- **Overall Length:** 67 ± 8 mm
- **Anode Pin Extension:** 5.5 mm maximum
- **Anode Pin Diameter:** 2.8 ± 0.1 mm
- **Cathode Body Diameter:** 26 mm
- **Window End Flange Diameters:** 31.9 ± 0.2 mm and 34.9 ± 0.2 mm
- **Window End Flange Thickness:** 4.8 ± 0.2 mm and 1.2 ± 0.2 mm

Electrical and Operating Characteristics

The electrical behavior of the 18523 is characterized by its low capacitance and stable plateau characteristics. At an ambient temperature of 20 °C, the tube exhibits the following parameters:

- **Interelectrode Capacitance:** 3 pF
- **Starting Voltage (Vign):** Minimum 480 V, maximum 500 V
- **Minimum Operating Voltage (Vb):** 600 V
- **Plateau Length:** Minimum 150 V
- **Plateau Slope:** Typically 0.07 %/V, with a maximum limit of 0.15 %/V
- **Background Count Rate:** 10 counts per minute when shielded with 2" of lead (Pb) and 1/4" of aluminum (Al)
- **Expected Operating Life:** Minimum 5 x 10¹⁰ counts

Environmental Limits

The tube is rated for operation across a wide thermal range. The absolute limiting values for ambient temperature are:

- **Minimum Ambient Temperature:** -55 °C
- **Maximum Ambient Temperature:** +75 °C

Dead Time and Plateau Characteristics

The recovery characteristics and counting response of the 18523 vary with the applied operating voltage.

Dead Time Dependency

The dead time of the counter tube decreases non-linearly as the operating voltage increases. This relationship is documented at several specific voltage points:

- **At $V_b = 500$ V:** ~180 microseconds
- **At $V_b = 600$ V:** ~75 microseconds
- **At $V_b = 700$ V:** ~45 microseconds
- **At $V_b = 770$ V:** ~38 microseconds

As the operating voltage rises from 500 V to 700 V, the dead time drops steeply, eventually leveling off into a flatter region of approximately 38 to 45 microseconds at voltages above 700 V.

Plateau Curve Behavior

When plotting the counting rate (counts per second) against the operating voltage (V_b), the 18523 exhibits a characteristic Geiger-Müller response. The counting rate rises sharply starting at the ignition threshold of 480 V. It then knees into a highly stable, very flat plateau starting around 500 V. This plateau region extends upward to at least 800 V, ensuring that minor fluctuations in the high-voltage power supply do not significantly affect the measured count rate.

Circuit Configuration and Application

In practical applications, the 18523 requires a specific external circuit configuration to ensure proper quenching and signal extraction.

Recommended Operating Circuit

The standard operating circuit configuration is defined as follows:

- **Cathode Connection:** Grounded directly.
- **Anode Connection:** Connected to the high-voltage supply ($+V_b$) through an anode load resistance (R_a) consisting of two 2.7 M Ω resistors connected in series (providing a total series resistance of 5.4 M Ω).
- **Signal Output:** The output pulse is taken from the junction point between the two series-connected 2.7 M Ω resistors.

This dual-resistor series arrangement distributes the voltage drop and provides a convenient, low-capacitance tap for extracting the negative-going charge pulses generated during ionization events.

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	—
Mica window thickness	1.5-2.5 mg/cm2	—
Mica window area	455 mm2	—
Mica window effective diameter	24.1 mm	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Interelectrode capacitance	3 pF	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Starting voltage minimum	480 V	—
Starting voltage maximum	500 V	—
Plateau length minimum	150 V	—
Plateau slope typical	0.07 %/V	—
Plateau slope maximum	0.15 %/V	—
Shielded background	10 counts/min	2inPb;1/4inAl
Expected count life minimum	50000000000 counts	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Operating voltage minimum	600 V	—