

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
GEIGERMULLERCOUNTER

18520

Specialized - Radiation Counter electronic tube

Halogen-quenched Philips Geiger-Müller counter designed specifically for gamma-radiation measurement, with a stable counting plateau and long-life fill for monitoring and radiation-measurement instrumentation.

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.

18520 — Halogen-Quenched Geiger-Müller Radiation Counter Tube

The **18520** is a halogen-quenched Geiger-Müller radiation counter tube designed specifically for the measurement of gamma radiation. It features a robust metal cathode construction and is filled with a mixture of neon, argon, and a halogen quenching agent. The tube is characterized by its long expected operating life, stable plateau characteristics, and wide operating temperature range.

Construction and Physical Dimensions

The 18520 is constructed with a cylindrical cathode made of a chromium-iron alloy consisting of **27% chromium and 73% iron**. This cathode has a wall thickness of **0.7 mm**, an inside diameter of **20.8 mm**, and an effective length of **140 mm**.

Physically, the tube has a maximum overall length of **170 mm** and an outer diameter of **22.2 mm**. Electrical connections are made via flying leads with a length of **100 mm**. The leads are color-coded for polarity:

- **Black wire:** Cathode (k)
- **Red wire:** Anode (a)

The total weight of the device is **75 g**. The interelectrode capacitance of the tube is **4.5 pF**.

Operating Characteristics and Electrical Parameters

At an ambient temperature of 20 °C, the 18520 exhibits the following electrical and operating parameters:

- **Starting Voltage (V_{ign}):** Minimum 330 V, Maximum 345 V.
- **Operating Voltage (V_b):** Minimum 375 V.
- **Anode Resistor (R_a):** Two series-connected 2.7 M Ω resistors (totaling 5.4 M Ω).
- **Plateau Length:** Minimum 100 V.
- **Plateau Slope:** Typically 0.05 %/V, with a maximum limit of 0.15 %/V.
- **Expected Life:** Minimum 5×10^{10} counts, enabled by the self-healing properties of the halogen quenching agent.

Background Count Rates

The background count rate of the tube depends heavily on shielding:

- **Unshielded:** 90 counts per minute.
- **Shielded** (with 2 inches of lead [Pb] and 1/4 inch of aluminum [Al]): 40 counts per minute.

Environmental Limits

The 18520 is rated for operation under extreme environmental conditions. Its absolute limiting value for ambient temperature (t_{amb}) ranges from **-55 °C to +75 °C**.

Circuit Configuration and Operating Example

In a typical application circuit, the 18520 is configured with a grounded cathode. The anode is connected to the positive high-voltage supply ($+V_b$) through two series-connected **2.7 M Ω** resistors. The output signal is extracted directly from the junction between these two series resistors. This configuration provides the necessary current limiting and signal decoupling for pulse detection.

Curve Characteristics and Dead Time Behavior

The performance of the 18520 can be understood through its characteristic curves:

- **Plateau Curve (Counts/sec vs. V_b):** The tube displays a stable plateau starting around 360 V and extending up to approximately 500 V. Above 550 V, the count rate begins to rise steeply, indicating the end of the plateau region and the onset of continuous discharge.
- **Dead Time Curve (Dead time vs. V_b):** The dead time of the tube varies dynamically with the applied operating voltage. At 360 V, the dead time starts at approximately **170 microseconds**. It rises to a maximum of about **210 microseconds** at around 460 V, before decreasing to approximately **120 microseconds** as the voltage is increased to 600 V.

Technical Summary

The **18520** is a highly reliable, halogen-quenched Geiger-Müller tube optimized for gamma radiation detection. Featuring a chromium-iron cathode, a starting voltage of 330–345 V, and a minimum operating voltage of 375 V, it offers a stable plateau of at least 100 V with a very low slope (typically 0.05 %/V). With its wide operating temperature range of -55 °C to +75 °C and an expected life exceeding 5×10^{10} counts, the 18520 is well-suited for robust radiation monitoring applications.

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	4.5 pF	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Starting voltage minimum	330 V	—
Starting voltage maximum	345 V	—
Plateau length minimum	100 V	—
Plateau slope typical	0.05 %/V	—
Plateau slope maximum	0.15 %/V	—
Unshielded background	90 counts/min	—
Shielded background	40 counts/min	2inPb;1/4inAl
Expected count life minimum	50000000000 counts	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Operating voltage minimum	375 V	—