



ELECTRONIC TUBE REFERENCE

150C2

Voltage Regulator electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

VOLTAGEREGULATOR

Two-electrode gas voltage stabilizer maintaining approximately 150 V over a 5–30 mA discharge-current range.

GENERAL CHARACTERISTICS

BASE DESIGNATION	–	BASE PINS	7
NOMINAL HEATER	– / –	PARALLEL HEATER	– / –
HEATING	Indirect; cold cathode	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Voltage Regulator	
REGULATOR VOLTAGE	150 V
MINIMUM REGULATOR CURRENT	5 mA
MAXIMUM REGULATOR CURRENT	30 mA
STARTING VOLTAGE	185 V
MAINTAINING VOLTAGE	150 V
DYNAMIC IMPEDANCE	100 Ω
<i>Gas-discharge device.</i>	

150C2 — Gas-Filled Voltage Stabilizer Tube

The **150C2** (also designated as the **0A2**) is a cold-cathode, gas-filled, two-electrode voltage stabilizer tube designed to provide a highly stable regulated DC output of approximately 150 V. Operating over a burning current range of 5.0 mA to 30 mA, this tube is primarily employed in shunt voltage regulation circuits to stabilize power supply voltages against fluctuations in load current or input supply voltage.

Physical Construction and Pinout

The 150C2 is a compact, lightweight device weighing approximately 10 grams. It features a cold-cathode design, meaning it does not require a heater filament, thereby eliminating heater power consumption and associated thermal delay. The tube is housed in a miniature glass envelope conforming to the DIN 41537, Form A, Nenngröße 50 standard, and it can be mounted and operated in any physical position.

The physical dimensions of the tube are specified within the following limits:

- **Maximum overall length:** 67.3 mm to 67.5 mm
- **Maximum length excluding pins:** 60.3 mm to 60.5 mm
- **Maximum cylindrical body length (shoulder height):** 53.1 mm
- **Maximum bulb diameter:** 19 mm

The tube utilizes a standard 7-pin miniature (B7G) base. The pin connections, viewed from the underside of the base, are configured as follows:

Pin	Connection
1	Anode (a)
2	Cathode (k)
3	Internal Connection (IC / i.V.)
4	Cathode (k)
5	Anode (a)
6	Internal Connection (IC / i.V.)
7	Cathode (k)

The internal connections (pins 3 and 6) are reserved for internal tube structure and must not be used as tie points for external circuit wiring. The redundant anode (pins 1 and 5) and cathode (pins 2, 4, and 7) connections are internally linked. This multi-pin layout allows designers to wire the tube as a safety interlock switch; if the tube is unplugged from its socket, the connection between the supply and the load is physically broken, protecting downstream components from unregulated high voltage.

Electrical Characteristics and Operating Parameters

The 150C2 maintains a remarkably flat voltage characteristic across its specified current range. Under typical operating conditions at room temperature, its electrical parameters are defined as follows:

- **Nominal Maintaining Voltage (U_{arc}):** 150 V, typically measured at a burning current (I_a) of 17.5 mA. Individual tubes exhibit a maintaining voltage range between 144 V and 164 V at this current.
- **Maintaining Voltage Limits over Current Range:**
 - At the minimum burning current ($I_a = 5.0 \text{ mA}$), the maintaining voltage across all tubes is at least 142 V.

- At the maximum burning current ($I_a = 30 \text{ mA}$), the maintaining voltage does not exceed 165 V.
- **Voltage Regulation (ΔU_{arc}):** For any individual tube, the maximum variation in maintaining voltage when the current fluctuates between 5.0 mA and 30 mA is 6.0 V, with a typical variation of 4 V.
- **Dynamic AC Resistance ($R_{\sim}$):** The tube exhibits a typical dynamic impedance of 100Ω , which represents its ability to suppress AC ripple on the regulated DC line.
- **Equilibrium Time:** Following ignition, the tube requires approximately 3 minutes of continuous operation to reach thermal and electrical equilibrium, after which its maintaining voltage stabilizes completely.

Ignition and Striking Behavior

Before the tube can enter its stable conducting (burning) state, the gas mixture inside must be ionized. This process requires the application of a supply voltage (U_b) that exceeds the tube's striking or ignition voltage (U_z). The ignition voltage is highly sensitive to ambient light conditions:

- **In ambient light:** The maximum ignition voltage of the tube itself is 180 V. To guarantee reliable striking across all tubes under normal ambient illumination, the minimum circuit supply voltage (U_b) must be at least 185 V.
- **In complete darkness:** The absence of photoionization increases the striking threshold. To ensure instantaneous ignition without significant delay in total darkness, a supply voltage of at least 225 V must be provided.

Absolute Maximum Ratings

To prevent damage and ensure the specified operating lifetime, the 150C2 must not be subjected to conditions exceeding its absolute maximum ratings:

- **Maximum Continuous Burning Current ($I_{a \text{ max}}$):** 30 mA
- **Minimum Continuous Burning Current ($I_{a \text{ min}}$):** 5.0 mA
- **Maximum Starting Current ($I_{a \text{ sp}}$):** 75 mA, permitted for a maximum duration of 10 seconds during circuit turn-on.
- **Maximum Negative Anode Voltage:** 125 V to 140 V (depending on the specific rating standard applied).
- **Operating Ambient Temperature Limits (T_U):** -55 °C to +90 °C

Circuit Design and Application Guidelines

When integrating the 150C2 into a shunt regulator circuit, several design constraints must be observed to maintain stability and prevent circuit malfunction.

Shunt Capacitance and Relaxation Oscillations

A critical consideration in voltage stabilizer circuits is the prevention of relaxation oscillations (often referred to as *Kippschwingungen*). Due to the negative resistance characteristics of gas-discharge tubes, a capacitor connected directly in parallel with the tube can form an astable multivibrator circuit. To

prevent this unstable behavior, the maximum value of any parallel bypass capacitor (C_p) must not exceed **0.1 μ F**.

Power Dissipation Calculations

The power dissipated by the 150C2 is a direct function of its maintaining voltage and the current flowing through it.

Using the nominal maintaining voltage of 150 V and the maximum continuous burning current of 30 mA, the maximum continuous power dissipation of the tube is calculated as: $\text{Power}_{\text{max}} = U_{\text{arc}} \times I_{a \text{ max}} = 150 \text{ V} \times 0.030 \text{ A} = 4.5 \text{ W}$

At the minimum operating current of 5.0 mA, where the maintaining voltage can drop to its minimum limit of 142 V, the minimum power dissipation is calculated as: $\text{Power}_{\text{min}} = U_{\text{arc}} \times I_{a \text{ min}} = 142 \text{ V} \times 0.005 \text{ A} = 0.71 \text{ W}$

The series current-limiting resistor in the shunt regulator circuit must be selected such that the current through the 150C2 remains strictly within the 5.0 mA to 30 mA range under all load and line voltage variations.

Long-Term Stability and Life Performance

The 150C2 is engineered for high stability over extended operating periods. When the tube is operated continuously at its maximum rated current of 30 mA at room temperature, its performance characteristics over time are specified as follows:

- **Maintaining Voltage Drift (1000 Hours):** The percentage variation of the maintaining voltage at $I_a = 30 \text{ mA}$ during 1000 hours of continuous life is typically within $\pm 1\%$, with a maximum limit of $\pm 3\%$. Under alternative operating conditions (such as continuous operation at 17.5 mA), the maximum percentage variation is rated at 2.0%.
- **Post-Life Regulation:** After extended operation, the typical maximum difference between the maintaining voltages at $I_a = 30 \text{ mA}$ and $I_a = 5.0 \text{ mA}$ is 5 V.

Technical Summary

The **150C2** is a **7-pin miniature, gas-filled, cold-cathode voltage stabilizer tube** designed to maintain a constant **150 V DC** output. It operates over a burning current range of **5.0 mA to 30 mA** and exhibits a typical dynamic AC resistance of **100 Ω** . To ensure reliable ignition, a minimum supply voltage of **185 V** is required in ambient light, rising to **225 V** in complete darkness. The tube's physical design features a **B7G base** with redundant anode and cathode pins, allowing for safety interlock wiring. When designing circuits with the 150C2, the parallel shunt capacitance must be kept below **0.1 μ F** to prevent relaxation oscillations, and the operating current must be strictly maintained within the rated limits to ensure a stable, long-term operating life with minimal voltage drift.

SOURCE OPERATING CONDITIONS

1953 RFT Rundfunk Technik

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

1953 RFT RUNDFUNK TECHNIK

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Nominal maintaining voltage	150 V	—
Voltage variation over current range	4.5 V	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Current range	5 to 30 mA	—
Nominal current	17.5 mA	—

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1963 Mullard

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

1963 MULLARD

Section 1 · Voltage Regulator

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ignition voltage minimum - ambient light	185 V	—
Ignition voltage minimum - complete darkness	225 V	—
Burning current maximum	30 mA	—
Burning current minimum	5 mA	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Negative anode voltage maximum	140 V	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maintaining voltage	150 V	—
Maintaining-voltage difference maximum	6 V	—
Maintaining-voltage life variation maximum	2 %	—
Warm-up to equilibrium	3 min	—

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	150 V gas voltage stabilization	—



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 Mullard Gas Filled Tubes

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

1971 MULLARD GAS FILLED TUBES

Section 1 · Voltage Regulator

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ignition/striking voltage	185 V	—