ELECTRONIC TUBE REFERENCE

13201

Voltage Regulator electronic tube

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
VOLTAGEREGULATOR

Heavy-duty neon voltage stabilizer providing approximately 100 V at roughly 15–200 mA for substantial industrial and shunt-regulated supplies.

General characteristics

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

Section ratings

SECTION1 Voltage Regulator

REGULATOR VOLTAGE	100 V
MINIMUM REGULATOR CURRENT	15 mA
MAXIMUM REGULATOR CURRENT	200 mA
STARTING VOLTAGE	140 V
MAINTAINING VOLTAGE	100 V
DYNAMIC IMPEDANCE	90 Ω

Cold-cathode gas-filled Philips voltage stabilizer/reference tube.

13201 — Neon Voltage Stabiliser Tube

A heavy-duty, cold-cathode, gas-filled voltage regulator designed to maintain a stable DC potential of approximately 100 V over a wide operating current range.

Overview

The **13201** is a robust, neon-filled voltage stabiliser tube (also designated as a *tube stabilisateur de tension* or *Spannungsstabilisierungsröhre*) manufactured by Philips and Mullard. It is engineered for high-current industrial and laboratory power supply regulation, where it maintains a stable operating voltage of approximately 100 V.

Unlike low-current reference tubes, the 13201 is capable of handling a continuous operating current of up to 200 mA, with a nominal quiescent current of 100 mA. This makes it particularly suitable for applications requiring stable voltage under heavily fluctuating load conditions.

Physical Construction, Dimensions, and Base

The 13201 is constructed in a large glass envelope. The physical dimensions vary slightly across historical specifications, with early documentation listing maximum dimensions of 144 mm in height and 53 mm in diameter without pins. Later standardized specifications define a maximum envelope diameter of 54 mm, a maximum height of 136 mm excluding the pins, and a maximum overall height of 154 mm (with a pin length of approximately 18 mm).

The tube is fitted with a Type A base (also designated as Ed or A40, with connection references XX or XIX). The base features a 4-pin configuration with the following electrode connections:

- **Pin 1**: Anode (a)
- **Pin 4**: Cathode (k)
- **Pins 2 and 3**: Unused (no internal connection)

Due to its gas-filled construction and electrode alignment, the tube is subject to specific mechanical and environmental constraints. It must not be subjected to severe shock or continuous vibration, which could damage the internal structure or alter the stabilization characteristics.

Electrical Characteristics and Operating Conditions

The electrical operation of the 13201 is characterized by three distinct phases: striking (ignition), burning (stabilisation), and extinction.

Parameter	Minimum	Typical / Nominal	Maximum
Starting (Striking) Voltage (V_{ign})	—	—	135 V – 140 V
Operating (Burning) Voltage (V_a)	90 V	100 V	110 V
Extinction Voltage	85 V	—	110 V
Operating Current (I_a)	15 mA	100 mA	200 mA

Parameter	Minimum	Typical / Nominal	Maximum
A.C. Resistance (Internal Impedance)	—	80Ω	90Ω

Striking and Ambient Light Dependency

To initiate conduction, the voltage applied across the tube must exceed the starting (striking) voltage, which is rated at a maximum of 135 V to 140 V. This striking voltage rating is specified in the presence of some ambient illumination. In complete darkness, the absence of photo-ionization can cause a considerable delay in igniting the tube.

Operating Voltage and Current Limits

Once ignited, the tube enters its normal glow-discharge region, maintaining a burning voltage (V_a) between 90 V and 110 V, with a nominal value of 100 V at the quiescent current of 100 mA. The absolute limits for safe and stable operation restrict the anode current (I_a) to a minimum of 15 mA and a maximum of 200 mA. Although some early documentation notes a lower current limit for stabilisation of 5 mA, the absolute minimum operating current is established at 15 mA to prevent oscillation or drop-out.

Polarity Requirement

The 13201 is an asymmetric cold-cathode device and must be operated strictly with the correct electrical polarity: the cathode must be connected to the negative potential and the anode to the positive potential. Reverse operation will fail to stabilise and can permanently damage the tube's electrodes.

Performance Curves and Regulation Dynamics

The regulation capability of the 13201 is defined by its voltage variation over the full operating current range. When the current fluctuates from the minimum of 15 mA to the maximum of 200 mA, the average voltage variation across the tube is typically 12 V, with a maximum limit of 20 V.

The dynamic behavior is illustrated by the characteristic curve of terminal voltage (V_b) versus operating current (I). The curve exhibits a highly linear, positive slope across the active regulation region:

- At the minimum current of **15 mA**, the terminal voltage is approximately **92 V**.
- At the quiescent current of **100 mA**, the voltage rises to approximately **98 V – 100 V**.
- At the maximum current of **200 mA**, the voltage reaches approximately **106 V – 107 V**.

This linear relationship corresponds to an internal AC resistance (dynamic impedance) of typically 80 Ohms, with a maximum limit of 90 Ohms. The low AC resistance ensures that even large changes in load current result in relatively minor variations in the output voltage, making the 13201 an exceptionally effective high-current regulator.

Technical Summary

The **13201** is a heavy-duty, cold-cathode, neon-filled voltage stabiliser tube designed for robust voltage regulation applications. Operating with a nominal burning voltage of **100 V** over a current range of **15 mA to 200 mA**, it features a typical AC resistance of **80 Ω** and a maximum voltage variation of **12 V to 20 V** across its entire operating envelope. Housed in a max **54 mm** diameter glass bulb with a **Type A** 4-pin base, the tube requires correct polarity (cathode negative, anode positive) and some ambient light to ensure prompt striking below its maximum ignition voltage of **135 V – 140 V**.

SOURCE OPERATING CONDITIONS

SOURCE PDF

1938 Philips Miniwatt Vacuum Tube Catalog

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

1938 PHILIPS MINIWATT VACUUM TUBE CATALOG

Section 1 · Voltage Regulator

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Running voltage	**90–110 V**	AtQuiescentCurrent=100mA
Quiescent current	**100 mA**	AtPublishedRunningVoltage
Maximum permissible current	**200 mA**	—
Lower current limit for stabilisation	**5 mA**	—

CHARACTERISTIC		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Striking voltage	**100–135 V**	—
Extinction voltage	**85–110 V**	—
AC resistance	**80 ohm**	Dynamic

SOURCE DATA APPENDIX

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 · Voltage Regulator

CHARACTERISTICS		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Operating Voltage	**100 V**	—
Regulation	**20 V**	Published current range

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Ignition Voltage Maximum	**140 V**	—
Minimum Operating Current	**15 mA**	—
Maximum Operating Current	**200 mA**	—

SOURCE OPERATING CONDITIONS

1963 Mullard

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1963 MULLARD

Section 1 · Voltage Regulator

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Ignition/starting voltage maximum	**135 V**	—
Quiescent current	**100 mA**	—
Operating current maximum	**200 mA**	—
Operating current minimum	**15 mA**	—

CHARACTERISTICS		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Burning voltage range	**90 to 110 V**	—
AC resistance	**80 ohm**	—

APPLICATION		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Application	**Heavy-duty neon voltage stabilization**	—

SOURCE OPERATING CONDITIONS

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1963 Philips Electron Tubes Handbook V2

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

1963 PHILIPS ELECTRON TUBES HANDBOOK V2

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Maintaining voltage at 100 mA	**100 V**	—
Voltage regulation	**—20 V**	Ia=15-200mA

SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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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 · Voltage Regulator

CHARACTERISTICS		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Average operating voltage	**100 V**	—
Maximum regulation variation	**20 V**	—
Dynamic AC resistance	**90 ohm**	—

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Maximum starting voltage	**140 V**	—
Minimum operating current	**15 mA**	—
Maximum operating current	**200 mA**	—

Tube Tinker

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