



ELECTRONIC TUBE REFERENCE

1949

Specialized - Gauge Tube electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
GAUGE

Hard-glass ionization vacuum-gauge tube with two filaments, one serving as a spare, for high-vacuum gas-pressure measurement.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	5 V / 3.5 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Gauge

No fixed ratings recorded.

Published maximum ratings and device-specific characteristics are promoted where schema-compatible; remaining switching/gauge/regulator electrical data is retained in section parameters.

1949 — Ionization-Type Vacuum-Gauge Tube

An ionization-type vacuum-gauge tube designed for measuring gas pressures in high-vacuum systems and enclosures, featuring a hard-glass envelope and dual tungsten filaments.

Overview

The **1949** is a specialized ionization-type vacuum-gauge tube designed to determine gas pressures in vacuum systems and vacuum enclosures. It operates by ionizing residual gas molecules within the system and measuring the resulting positive ion current. The tube is capable of measuring extremely low pressures, with a useful sensitivity range extending below 0.1 micron of mercury (Hg), or less than 10^{-4} mm of Hg.

To ensure a long operating life, the 1949 is constructed with two independent tungsten filaments—one active and one spare. If the primary filament fails or becomes depleted, the spare filament can be connected to continue operation without replacing the entire tube.

Construction and Physical Dimensions

The 1949 is built with a T-16 hard-glass bulb and features Corning Code 772 Nonex hard-glass tubulation. This tubulation is designed to be sealed directly to the vacuum system under test.

The physical dimensions and mechanical features of the tube include:

- **Maximum Tube Length:** 11-1/2 inches to 11-3/4 inches (excluding flexible leads)
- **Maximum Tube Radius:** 2-3/16 inches
- **Maximum Bulb Length:** 5-1/8 inches
- **Maximum Bulb Diameter:** 2-1/16 inches
- **Tubulation Diameter:** 3/8 inch to 1/2 inch
- **Terminal Leads:** Four flexible leads (0.050-inch diameter, approximately 4-1/2 inches long) extending from the base, and one top lead (0.050-inch diameter, approximately 1-5/16 inches long) serving as the plate terminal.

Operating Position

The tube can be operated in either a vertical or horizontal position. When mounted vertically, the tubulation may point either up or down. When mounted horizontally, the tube must be oriented so that the internal stem press remains in a vertical plane.

Terminal Connections and Filament Ratings

The 1949 utilizes a five-terminal connection scheme. The four flexible base leads and the single top lead are connected as follows:

- **Lead 1:** Common lead to filaments
- **Lead 2:** Filament (Main or Spare)
- **Lead 3:** Filament (Spare or Main)
- **Lead 4:** Grid
- **Top Lead:** Plate (associated with the tubulation)

Filament Characteristics

The tungsten filaments are designed for low-voltage, high-current operation. The electrical characteristics for either filament operated alone are:

Filament Parameter	Value
Nominal Voltage (AC or DC)	5.0 V

Filament Parameter	Value
Nominal Current	3.5 A
Absolute Maximum Voltage	6.5 V

During degassing, the filament voltage should be kept as low as possible to prevent premature aging and maximize the overall life of the filaments.

Electrical Ratings and Operating Limits

The absolute maximum ratings for the 1949 define the safe limits for both normal operation and the degassing process. Operating the tube outside of these limits may cause permanent damage or alter the calibration of the gauge.

Parameter	Maximum Rating
Filament Voltage	6.5 V
DC Plate Voltage (during operation)	-100 V
DC Grid Voltage (during operation)	+200 V
Voltage on Grid & Plate tied together (during degassing, DC or Peak AC)	650 V
Grid & Plate Dissipation (Total, during degassing)	150 W
Ambient Temperature (during operation)	100 °C
Gas Pressure	0.001 mm of Hg

Typical Operation and Sensitivity

During typical operation, the plate is biased negatively to collect positive ions, while the grid is biased positively to accelerate electrons from the filament. These accelerated electrons collide with and ionize the residual gas molecules.

The sensitivity of the tube is defined as the ratio of plate current (ion current) to gas pressure at a specified grid current. For dry air, with a constant grid current (I_C) of 10 mA and a DC plate voltage (E_b) of -22.5 V, the typical operating parameters are:

Parameter	Operating Point A	Operating Point B	Operating Point C
DC Plate Voltage	-22.5 V	-22.5 V	-22.5 V
DC Grid Voltage	+80 V	+110 V	+160 V
Grid Current	10 mA	10 mA	10 mA

Parameter	Operating Point A	Operating Point B	Operating Point C
Sensitivity (per micron of Hg)	80 μ A	110 μ A	140 μ A

(Note: 1 micron of Hg is equal to 0.001 mm of Hg).

Calibration and Curve Characteristics

The relationship between gas pressure and plate current is highly linear when plotted on a log-log scale across the pressure range of 10^{-7} to 10^{-4} mm of Hg. Operating at higher grid voltages (+110 V or +160 V) increases the ionization efficiency, shifting the calibration curves to higher plate currents for any given pressure and resulting in higher sensitivity.

Degassing Procedure

Adsorbed gases on the internal metal parts of the tube can release slowly over time, causing false pressure readings. To prevent this, the tube must be periodically degassed by heating the grid and plate electrodes. This is achieved by connecting the grid and plate together and applying a high voltage to draw electron current from the filament.

Typical degassing conditions are specified for both AC and DC methods:

Parameter	AC Degassing	DC Degassing
Filament Voltage (AC or DC)	6.0 V	6.0 V
Grid & Plate Voltage	350 rms V	500 dc V
Grid & Plate Current (Average)	100 mA	150 mA

During degassing, the combined dissipation of the grid and plate must not exceed the absolute maximum rating of 150 W, and the voltage applied to the tied elements must not exceed 650 V (DC or peak AC).

Technical Summary

The **1949** is an **ionization-type vacuum-gauge tube** featuring a **T-16 hard-glass bulb** with **Corning Code 772 Nonex tubulation** and a **dual tungsten filament system** (one active, one spare) rated at **5.0 V / 3.5 A**. It is designed to measure gas pressures below **0.1 micron of Hg** (10^{-4} mm of Hg).

By operating with a negative plate voltage (**-22.5 V**) and a positive grid voltage (**+80 V to +160 V**), the tube establishes a linear relationship between gas pressure and ion plate current, providing sensitivities of **80 to 140 μ A/micron** at a constant grid current of **10 mA**. The tube supports both AC and DC degassing methods up to a maximum combined electrode dissipation of **150 W** to maintain measurement accuracy.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1960 RCA Industrial and Communications Types

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

1960 RCA INDUSTRIAL AND COMMUNICATIONS TYPES

Section 1 · Gauge

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum filament voltage	6.5 V	—
Maximum plate voltage	-100 V	Polarity as printed
Maximum grid voltage	200 V	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Useful pressure upper	0.1 micron Hg	—
Useful pressure lower	0.0001 micron Hg	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 RCA HB3 Binder 2 of 7

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

1971 RCA HB3 BINDER 2 OF 7

Section 1 · Gauge

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Voltage (Approx.)	5 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Current (Approx.)	35 A	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
DC PLATE VOLTAGE DURING OPERATION	-100 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Filament Voltage (AC or DC) – published value 1	6 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Filament Voltage (AC or DC) – published value 2	6 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Grid 6 Plate Voltage – published value 1	6 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Grid 6 Plate Voltage – published value 2	350 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Grid 6 Plate Voltage – published value 3	500 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Current (Average) – published value 1	100 mA	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Current (Average) – published value 2	150 mA	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
DC Plate Voltage – published value 1	-22.5 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
DC Plate Voltage – published value 2	-22.5 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
DC Plate Voltage – published value 3	-22.5 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
DC Grid Voltage	0 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
1949 – published value 1	1949 A	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
1949 – published value 2	10 A	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
—	22.5 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Heater or filament voltage nominal	5 V	Nominal value from supplied datasheet.
Heater or filament current nominal	3.5 A	Nominal or average value from supplied datasheet.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
FILAMENT VOLTAGE	6.5 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
DC GRID VOLTAGE DURING OPERATION	200 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
DURING DEGASSING (DC OR PEAK AC)	650 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
AMBIENT TEMPERATURE DURING OPERATION	100 mA	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
GAS PRESSURE – published value 1	0 mA	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
GAS PRESSURE – published value 2	1 mA	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.

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