

ELECTRONIC TUBE REFERENCE

150CVP

Specialized - Photo Tube electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PHOTOEMISSIVEDETECTOR

Amperex photomultiplier with extended spectral response reaching approximately 800 nm for visible and near-infrared light detection.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	— / —	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 PhotoemissiveDetector	
MAXIMUM PLATE DISSIPATION	0.5 W
Amperex photomultiplier tube with extended spectral response to approximately 8000 angstroms.	

150CVP — Ten-Stage Infrared Photomultiplier Tube

A ten-stage, head-on photomultiplier tube featuring a caesium-on-oxidized silver photocathode, optimized for detection and amplification in the red and near-infrared spectral regions.

Overview

The **150CVP** is a specialized 10-stage photomultiplier tube designed for applications requiring high sensitivity in the far red and near-infrared portions of the light spectrum. It features a semi-transparent, flat, head-on photocathode with a nominal diameter of 32 mm. The tube's spectral response peaks at 8000 Å, making it highly effective for infrared telecommunication, ranging, and optical instrumentation.

Typical applications for the 150CVP include astronomical measurements, spectrometry, optical pyrometry, and infrared radiation intensity control instruments. Its design allows for high gain and linear pulse response when operated with appropriate voltage divider networks.

Construction and Physical Dimensions

The 150CVP is constructed with a flat-surface, semi-transparent photocathode deposited directly on the inner surface of the tube's faceplate. The photocathode material is caesium-on-oxidized silver (AgOCs). The multiplier system consists of 10 dynode stages fabricated from silver-magnesium-caesium (AgMgOCs).

The physical dimensions and mounting requirements of the tube are as follows:

- **Maximum overall length (including pins):** 127 mm
- **Maximum seated height / body length:** 115 mm
- **Maximum body diameter:** 38 mm
- **Maximum faceplate diameter:** 39.5 mm
- **Minimum useful photocathode diameter:** 32 mm
- **Base/Socket:** 12-pin socket, type No. B8 700 42

Because photomultiplier tubes are highly sensitive to external magnetic fields, it is recommended to screen the 150CVP with a mu-metal screening cylinder. A suitable screening cylinder (such as type [56127](#)) has a length of 90 ± 1 mm and a diameter of 42 mm (+1, -0 mm).

Electrical Characteristics and Ratings

The 150CVP exhibits distinct photocathode and anode characteristics under specified operating conditions.

Photocathode Characteristics

- **Cathode Material:** AgOCs
- **Wavelength of Maximum Response:** $8000 \pm 1000 \text{ \AA}$
- **Luminous Sensitivity:** Average of 30 $\mu\text{A/lm}$, with a minimum of 20 $\mu\text{A/lm}$ (measured using a tungsten ribbon lamp at a color temperature of 2850 K).
- **Radiant Sensitivity:** Average of 3 mA/W at a wavelength of 8000 $\text{\AA}$.
- **Dark Current:** $0.5 \times 10^{-12} \text{ A/cm}^2$ at an ambient temperature of 25 °C.

Multiplier and Anode Characteristics (at 1800 V Total Supply)

- **Anode Sensitivity:** Average of 100 A/lm, with a minimum of 20 A/lm.
- **Total Gain:** Approximately 3×10^6 to 5×10^6 .
- **Anode Dark Current:** Maximum of 5 μA (at an anode sensitivity of 20 A/lm) to 10 μA (10000 nA) depending on the specific operating limits.
- **Interelectrode Capacitance:**
 - Anode to final dynode: 3 pF

- Anode to all other electrodes: 5 pF

Voltage Distribution and Operating Circuits

The 150CVP can be operated using different voltage divider configurations depending on the application requirements. The two primary configurations are Type A and Type B.

Voltage Divider Type A (High Gain)

Type A is designed to provide the highest overall gain for a given total voltage. Under this configuration, the linearity between the anode pulse amplitude and the input light flux is maintained up to 30 mA. The voltage distribution is defined as follows:

- **Photocathode to Dynode 1 (D1):** 1.5 V₀
- **Between Dynodes (D1 to D9):** V₀
- **Dynode 10 to Anode:** 0.75 V₀
- **Total Voltage (V_b):** 11.25 V₀

Voltage Divider Type B (High Current)

Type B is optimized to deliver higher currents in the final stages, though the total gain is lower than Type A at the same total voltage. Under this configuration, the linearity between the anode pulse amplitude and the input light flux is extended up to 100 mA. The voltage distribution is defined as follows:

- **Photocathode to Dynode 1 (D1):** 2 V₀
- **Between Dynodes (D1 to D7):** V₀
- **Dynode 7 to Dynode 8:** 1.25 V₀
- **Dynode 8 to Dynode 9:** 1.5 V₀
- **Dynode 9 to Dynode 10:** 1.75 V₀
- **Dynode 10 to Anode:** 2 V₀
- **Total Voltage (V_b):** 14.5 V₀

Limiting Values

To prevent damage and ensure stable operation, the following absolute maximum and minimum limits must be observed:

Parameter	Minimum	Maximum
Total Supply Voltage	—	1800 V
Continuous Anode Current	—	1 mA
Anode Dissipation	—	0.5 W

Parameter	Minimum	Maximum
Voltage between Cathode and Dynode 1	120 V	500 V
Voltage between Dynodes	80 V	300 V
Voltage between Dynode 10 and Anode	80 V	300 V

Additionally, when operating at low supply voltages, the voltage between the photocathode and dynode 1 must never fall below 180 V, and the voltage between any other adjacent electrodes must never drop below 80 V.

Operational Considerations

Stability and Bridge Current

To maintain a gain stability of approximately 1%, the current flowing through the voltage-divider bridge must be significantly higher than the current through the heaviest loaded stage of the tube. The recommended ratio of bridge current to the heaviest stage current is approximately 100. For applications involving moderate radiation intensities, a bridge current of approximately 0.5 mA is sufficient.

Decoupling

When extracting high-amplitude pulses from the anode, a voltage drop can occur between the final stages. To prevent this, the last stages should be decoupled using capacitors with a value of a few hundred picofarads (pF), as shown in standard operating schematics.

Exposure to Light

If the 150CVP is exposed to full daylight prior to mounting, it will exhibit a temporarily elevated dark current. The dark current will gradually return to its normal specified value after several hours of operation in darkness.

Related Designations

The **XP1010** is a closely related photomultiplier tube. It is specifically selected for low noise and high resolution, while sharing all other physical and electrical characteristics with the 150CVP.

Technical Summary

The **150CVP** is a 10-stage, head-on photomultiplier tube featuring a 32 mm flat AgOCs photocathode and AgMgOCs dynodes. It is optimized for the red and near-infrared spectrum, peaking at 8000 Å. Operating at a maximum total voltage of 1800 V, it provides a total gain of 3×10^6 to 5×10^6 and an average anode sensitivity of 100 A/lm. By selecting either a Type A (high gain, linear to 30 mA) or Type B (high

current, linear to 100 mA) voltage divider, designers can tailor the tube's performance to specific pulse-amplitude or gain requirements.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1963 Amperex Condensed

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

1963 AMPEREX CONDENSED

Section 1 · PhotoemissiveDetector

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum useful photocathode diameter	32 mm	—
Number of stages	10 count	—
Recommended supply voltage	1800 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum spectral response wavelength	8000 angstrom	—
Average photocathode sensitivity	20 uA/lm	—
Minimum anode sensitivity	100 A/lm	—
Minimum gain at 1800 V	500000	Approximate; source gives 5×10^5

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 · PhotoemissiveDetector

CONSTRUCTION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Multiplier stages	11	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Useful photocathode diameter	44 mm	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Wavelength at maximum response	4200 angstrom	—
Typical anode sensitivity	100 A/lm	—
Maximum anode dark current	0.005 mA	—
Linear-response anode pulse current	30 mA	VoltageDividerTypeA
Linear-response anode pulse current	100 mA	VoltageDividerTypeB
Typical photocathode sensitivity	30 uA/lm	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum total voltage	1800 V	—
Maximum continuous anode current	1 mA	—
Maximum anode dissipation	0.5 W	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode-to-final-dynode capacitance	3 pF	—
Anode-to-all-other-electrodes capacitance	5 pF	—

TUBE TINKER

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