



ELECTRONIC TUBE REFERENCE

108D12GY119

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

High-bandwidth electrostatic cathode-ray display tube for instrumentation, with bandwidth to 25 MHz, a useful deflection area around 80 × 64 mm, and provisions for focus and astigmatism correction.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	6.3 V / —	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Cathode Ray*No fixed ratings recorded.**Published characteristics audited; remaining numerical data retained in parameter table.*

108D12GY119 — Single-Beam Oscilloscope Tube

The **108D12GY119** is a single-beam, single-acceleration electrostatic cathode-ray tube designed for use in oscilloscopes with bandwidths up to 25 MHz, such as portable service oscilloscopes and display units. It features a rectangular flat screen with a 12 cm diagonal, an integrated low-power heater cathode, and a permanently mounted correction coil for image rotation.

Mechanical Design and Screen Characteristics

The tube is constructed with a rectangular, planoparallel front plate. The screen utilizes a GY-type green phosphor with medium persistence. An internal, illuminable red graticule is integrated directly onto the

screen, featuring a 10 x 8 division layout based on an 8 mm grid. The graticule lines have a width of 0.2 mm, and the intersection points have a diameter of 0.4 mm. The planoparallel front plate features a ground edge designed for the lateral coupling of floodlight illumination to light the internal graticule.

To facilitate precise alignment of the internal graticule when mounting the tube into an oscilloscope front mask, three physical stop points (designated A, B, and C) are located on the edges of the close-tolerance front plate. The position of the internal graticule is directly referenced to these points. Because the glass seal seam is visible through the front plate and is not necessarily aligned with the internal graticule, the use of a front mask with an opening of 82 mm x 66 mm is recommended. The front plate, cone, and seal seam are designed to fit through a chassis opening of 101 mm x 85 mm.

Physical Dimensions and Mounting

Parameter	Value
Maximum overall length (with socket)	292 mm
Tube length (excluding socket pins)	268 ± 5 mm
Cone length	130 ± 5 mm
Maximum neck diameter	75 mm
Base type	12-pin JEDEC B12-246
Approximate mass	0.7 kg
Mounting position	Any

During installation, the tube must be mounted in a manner that prevents any mechanical stress on the glass bulb or the socket. The socket must never be used as a structural support to hold the weight of the tube.

Electron Gun and Deflection System

The 108D12GY119 utilizes an indirectly heated, low-power cathode (Sparheizkatode) designed for parallel supply using either alternating or direct current.

Heater Characteristics

Parameter	Value
Nominal heater voltage (U_F)	6.3 V
Nominal heater current (I_F)	100 mA
Heating time (t_h) to 10% of final cathode current	~ 7 s

The tube features electrostatic focusing and double-electrostatic, symmetrical deflection. A built-in permanent-magnetic electron-optical lens system is integrated to correct angular deviations between the horizontal and vertical deflection axes (orthogonality), vertical deviation (eccentricity), and astigmatism of the electron spot.

The nominal angle between the horizontal and vertical deflection directions is 90°. The angle between the horizontal deflection direction and the horizontal centerline of the internal graticule is a maximum of 5° (which can be corrected via the integrated coil). The undeflected spot may deviate from the physical center of the internal graticule by a maximum of 4 mm horizontally and 2 mm vertically. Deflection non-linearity is limited to a maximum of 2%, measured at 25% and up to 75% of the usable deflection area.

Interelectrode Capacitances

Electrode Connection	Capacitance Value
Deflection plate X1 to all except X2 ($c_{x1}(x2)$)	5.7 pF
Deflection plate X2 to all except X1 ($c_{x2}(x1)$)	5 pF
Deflection plate Y1 to all except Y2 ($c_{y1}(y2)$)	4 pF
Deflection plate Y2 to all except Y1 ($c_{y2}(y1)$)	4 pF
Deflection plate X1 to X2 (c_{x1x2})	2.3 pF
Deflection plate Y1 to Y2 (c_{y1y2})	1 pF
Control grid G1 to all (c_{g1})	6 pF
Cathode K to all (c_k)	3 pF

Electrical Ratings and Operating Conditions

The operating and maximum ratings of the 108D12GY119 are specified relative to the cathode unless otherwise noted.

Absolute Maximum Ratings (Grenzdaten)

Parameter	Symbol	Value
Screen electrode voltage	$UG5,(L)$	max. 2200 V
Acceleration and astigmatism correction voltage	$UG2G4/$	max. 2200 V
Focusing voltage	$UG3$	max. 2200 V
Control grid voltage (negative)	$-UG1$	max. 200 V / min. 0 V

Parameter	Symbol	Value
Grid drive voltage (average over 1 ms)	U_1	max. 20 V
Control grid leak resistance	R_{G1}	max. 1 M Ω
Specific screen load	PLM	max. 3 mW/cm ²
Heater-to-cathode voltage (either polarity)	U_{FK}	max. 125 V
Heater voltage	U_{FF}	max. 6.6 V / min. 6.0 V

Typical Operating Data (Betriebsdaten)

At typical operating points, the voltages are set as follows for optimal geometry:

Parameter	Symbol	Value
Screen electrode voltage	$UG_{5,(L)}$	2000 V
Mean potential of deflection plate pairs	ΔU_{XY}	2000 V
Acceleration and astigmatism correction voltage	$UG_{2G4/}$	2000 V
Focusing voltage	UG_3	220 to 370 V
Control grid voltage for visual spot extinction	$-UG_1$	22 to 65 V
Grid drive voltage for screen current $I_L = 10 \mu A$	U_1	~ 10 V
Horizontal deflection coefficient (d_x)	d_x	19 V/div (max. 21 V/div) / 23.8 V/cm (max. 26.3 V/cm)
Vertical deflection coefficient (d_y)	d_y	11 V/div (max. 11.5 V/div) / 13.8 V/cm (max. 14.4 V/cm)

The usable screen area is at least 82 mm x 66 mm, while the usable deflection area is at least 80 mm x 64 mm.

Integrated Correction Coil

The tube features a factory-installed correction coil secured to the neck using synthetic resin adhesive and adhesive tape. This coil is designed to correct rotational alignment errors of the displayed image.

Correction Coil Parameters

Parameter	Symbol	Value
Number of turns	n	1000
Coil resistance at 20°C	R_{20}	$185\ \Omega \pm 25\ \Omega$
Temperature coefficient of resistance	TKR	0.4%/K
Current required for $\pm 1^\circ$ image rotation	I_{Korr}	$\sim 5\ \text{mA}$
Maximum correction voltage	U_{Korr}	$\sim 11\ \text{V}$

The maximum correction voltage of approximately 11 V is sufficient to compensate for a tube alignment tolerance of up to $\pm 5^\circ$ combined with a geomagnetic residual field of up to $\pm 2^\circ$ (assuming reasonable external shielding is used).

Circuit Integration and Optimization

To maintain proper raster geometry and prevent distortion, the horizontal and vertical deflection plates must be driven with symmetrical deflection voltages. Unsymmetrical operation will degrade the raster geometry.

Deflection Plate Potential Alignment

For minimal adjustment effort during oscilloscope calibration, the mean potential of the horizontal deflection plates should equal the mean potential of the vertical deflection plates. Under this condition, the screen electrode G5 can be connected directly to the accelerator electrodes G2 and G4, and biased to the mean potential of the vertical deflection plates to achieve optimal spot shape.

A potential difference of less than 75 V between the mean potentials of the horizontal and vertical deflection plates is permissible. However, such a difference can alter the deflection coefficients and may require a separate, dedicated voltage supply for the screen electrode G5 (set equal to the mean potential of the horizontal deflection plates) to correct the raster geometry.

If the screen electrode voltage U_{G5} is kept equal to the mean potential of the horizontal deflection plates, the raster geometry deviations will remain within specified tolerances. Providing an adjustment range of $\pm 50\ \text{V}$ relative to the mean potential of the horizontal deflection plates allows for fine-tuning of the raster geometry.

Spot Shape and Focus Optimization

An optimal spot shape is achieved when the acceleration voltage $U_{[G2]}/(tubes/G2),G4$ is equal to the mean potential of the vertical deflection plates. Small deviations of up to $\pm 4\ \text{V}$ generally do not cause any visible degradation of the spot shape. As the screen electrode voltage U_{G5} is increased, the required

acceleration voltage $U_{[G2] (/tubes/G2),G4}$ shifts toward lower values. The acceleration voltage $U_{[G2] (/tubes/G2),G4}$ must be supplied from a low-impedance source with an internal resistance of less than 10 k Ω .

To simplify the adjustment of the spot shape, the voltage swing of the focus control on the oscilloscope front panel should be limited to 30 V. The required focusing voltage U_{G3} decreases as the grid drive voltage U_1 increases.

Intensity Control and Beam Loading

The voltage swing of the intensity control on the front panel should be limited to prevent the screen current I_L from exceeding its maximum useful value of approximately 50 μ A. This limit is typically reached at a grid drive voltage of up to 22 V, or when the maximum acceptable line width is reached.

The cathode current I_K or the accelerator electrode current $I_{[G2] (/tubes/G2),G4}$ (which can reach up to 500 μ A) cannot be used directly to set or calibrate the intensity. These currents are highly dependent on the specific control grid voltage $-U_{G1}$ required for visual spot extinction.

Furthermore, because the electron beam can graze the deflection plates at full deflection, the deflection amplifiers driving the plates must feature a low output impedance.

Technical Summary

The **108D12GY119** is a specialized, single-beam, electrostatic-deflection oscilloscope tube featuring a 12 cm rectangular flat screen with a green, medium-persistence GY phosphor. Operating with a nominal screen and acceleration potential of 2000 V, it provides a highly legible display with an integrated red graticule. The tube incorporates a low-power 6.3 V, 100 mA heater, electrostatic focusing, and an integrated 1000-turn correction coil to compensate for up to $\pm 5^\circ$ of rotational misalignment. With horizontal and vertical deflection coefficients of 19 V/div and 11 V/div respectively, and a design optimized for symmetrical drive, it is well-suited for high-precision portable service oscilloscopes and display systems operating at bandwidths up to 25 MHz.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1985 Valvo

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

1985 VALVO

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
mit einer Bandbreite bis	25 MHz	mit einer Bandbreite bis 25 MHz
Schirmelektrodenspannung UG5, (L) =	2000 V	Schirmelektrodenspannung UG5,(L) = 2000 V
Nutzbare Ablenkfl�che min [1]	80	Nutzbare Ablenkfl�che min. 80 mm x 64 mm
Nutzbare Ablenkfl�che min [2]	64	Nutzbare Ablenkfl�che min. 80 mm x 64 mm
Spannung UF =	6.3 V	Spannung UF = 6,3 V
Strom IF =	100 mA	Strom IF = 100 mA
Ablenkungs	4	Ablenkungs 4)
Ablenkrichtung	90	Ablenkrichtung: 90�
Abweichung von der Ablenklinearit�t [1]	9	Abweichung von der Ablenklinearit�t 9) max. 2 %
Abweichung von der Ablenklinearit�t [2]	2	Abweichung von der Ablenklinearit�t 9) max. 2 %
Ablenkraster bei IL = [1]	10	Ablenkraster bei IL = 10 pA: ca., 0,25 mm
Ablenkraster bei IL = [2]	0.25	Ablenkraster bei IL = 10 pA: ca., 0,25 mm
nutzbaren Ablenkfl�che ([1]	100	nutzbaren Ablenkfl�che (100 mm x 80 mm),
nutzbaren Ablenkfl�che ([2]	80	nutzbaren Ablenkfl�che (100 mm x 80 mm),
Heizspannung UF =	6.3 V	Heizspannung UF = 6,3 V
Heizstrom IF =	100 mA	Heizstrom IF = 100 mA
Heizzeit um	10	Heizzeit um 10 % des endlichen Katoden-
Schirmelektrodenspannung UG5, (L) = max,	2200 V	Schirmelektrodenspannung UG5,(L) = max, 2200 V
Astigmatismuskorrekturspannung UG2G4/ = max,	2200 V	Astigmatismuskorrekturspannung UG2G4/ = max, 2200 V
Fokussierspannung UGS = max	2200 V	Fokussierspannung UGS = max. 2200 V

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Steuergitterspannung -UGl = max,	200 V	Steuergitterspannung -UGl = max, 200V
Steuergitter Ableitwiderstand RG1 = max	1	Steuergitter Ableitwiderstand RG1 = max. 1 MQ
Spannung zwischen Heizfaden und Katode U_FK = max	125 V	Spannung zwischen Heizfaden und Katode U_FK = max. 125V
Heizfadenspannung UFF = max	6.6 V	Heizfadenspannung UFF = max. 6,6 V
Schirmelektrodenspannung	5 V	Schirmelektrodenspannung 5
der Ablenkplattenpaare [1]	4	der Ablenkplattenpaare 4) AUyy = 2000 V
der Ablenkplattenpaare [2]	2000	der Ablenkplattenpaare 4) AUyy = 2000 V
Beschleunigungsspannung und	6 V	Beschleunigungsspannung und 6
Astigmatismus-Korrekturspannung) UG2G4/	2000 V	Astigmatismus-Korrekturspannung) UG2G4/ 2000 V
Fokussierspannung [1]	7 V	Fokussierspannung 7) UG3 = 220...370 V
Fokussierspannung [2]	220...370 V	Fokussierspannung 7) UG3 = 220...370 V
Leuchtschirmstrom IL = [1]	10 A	Leuchtschirmstrom IL = 10 pA U1 s 10V
Leuchtschirmstrom IL = [2]	10 A	Leuchtschirmstrom IL = 10 pA U1 s 10V
Ablenkkoeffizient	10	Ablenkkoeffizient 10) <
auf das mittlere Potential	3	auf das mittlere Potential 3es vertikalen Ablenkplattenpaares gelegt werden
Eine Spannungsdifferenz <	75 V	Eine Spannungsdifferenz < 75 V zwischen dem mittleren Potential des hori-
Published value	5 V	5) Ist die Schirmelektrodenspannung U gleich dem mittleren Potential des
Published value	6 V	6) Eine optimale Leuchtfleckform kann mit einer Beschleunigungsspannung Ugs G4
Innenwiderstand (< [1]	10	Innenwiderstand (< 10 kQ) 74 entnehmen.
Innenwiderstand (< [2]	74	Innenwiderstand (< 10 kQ) 74 entnehmen.
Published value	7 V	7) Fir leichte Einstellung der optimalen Leuchtfleckform sollte der Spannungs-
Wert (IL ~	50	Wert (IL ~ 50 pA) begrenzt werden. Dieser wird durch einen Gitter-Steuer—
spannungswert (bis zu	22 V	spannungswert (bis zu 22 V) oder bei der zumutbaren max. Linienbreite er-
schleunigungselektrodenstrom ([1]	1 A	schleunigungselektrodenstrom (1 G4 bis zu 500 pA) können nicht zur Ein-

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
schleunigungselektrodenstrom ([2]	500 A	schleunigungselektrodenstrom (1 G4 bis zu 500 pA) können nicht zur Ein-
Published value [1]	9	9) gemessen bei 25 % und £ 75 % der nutzbaren Ablenkung.
Published value [2]	25	9) gemessen bei 25 % und £ 75 % der nutzbaren Ablenkung.
Published value [3]	75	9) gemessen bei 25 % und £ 75 % der nutzbaren Ablenkung.
Published value	1	10)Es müssen Ablenkverstärker mit niedriger Ausgangsimpedanz verwendet werden,