



ELECTRONIC TUBE REFERENCE

11D18HG

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

High-voltage cathode-ray display tube documented by Valvo with electrostatic deflection, post-acceleration, adjustable focusing, and astigmatism correction. Its electrode system is intended for precision trace display, and the documentation includes precautions associated with high accelerating voltages.

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.

11D18HG — Dual-Acceleration Oscilloscope Cathode Ray Tube

The **11D18HG** (also designated as the **11 D 18 GH**) is a high-performance, single-beam, dual-acceleration oscilloscope cathode ray tube (CRT) designed for compact oscilloscopes with bandwidths up to approximately 75 MHz, as well as data display terminals. It features a rectangular, metal-backed flat screen with an 18 cm diagonal and a green, medium-short persistence phosphor (GH type). The tube incorporates a curved mesh electrode to achieve high deflection sensitivity in a short physical envelope, alongside an integrated permanent-magnetic electron-optical lens system and a built-in image rotation correction coil.

Mechanical Construction and Screen Characteristics

The 11D18HG is constructed with a flat, plane-parallel glass front plate. The edge of this front plate is ground to allow the lateral coupling of floodlight illumination, which illuminates the integrated red internal graticule (featuring a 12 mm grid pattern). The internal graticule lines have a width of 0.2 mm, and the grid intersection dots have a diameter of 0.4 mm.

To facilitate precise mechanical alignment of the internal graticule within an instrument's front bezel, the front plate features three tightly toleranced reference stop points (Anschlagpunkte designated A1, A2, and A3) along its edges. The position of the internal graticule is directly referenced to these points.

The minimum useful screen area is 124 mm × 100 mm, while the minimum useful deflection area is 120 mm × 96 mm. The maximum overall length of the tube is 338 mm, and its mass is approximately 1.3 kg. The tube can be mounted in any position, provided that no mechanical glass stresses are introduced to the bulb or socket. The socket must never be used as the primary mechanical support for the tube.

Heater and Cathode Characteristics

The tube utilizes an indirectly heated, quick-heating cathode (Schnellheizkatode) designed for parallel supply using either alternating current (AC) or direct current (DC).

- **Nominal Heater Voltage (U_F):** 6.3 V
- **Nominal Heater Current (I_F):** 240 mA
- **Calculated Heater Power:** 1.512 W (calculated as $6.3\text{ V} \times 0.24\text{ A}$)
- **Heating Time (t_h):** Approximately 5 seconds to reach 10% of the steady-state cathode current.

Pinout and Electrode Connections

The 11D18HG uses a 12-pin base conforming to the JEDEC B12-246 standard. The electrical connections, viewed from the socket side, are assigned as follows:

Pin	Connection
1	Heater (F)
2	Cathode (K)
3	Control Grid (G1)
4	Focusing Electrode (G3)
5	First Acceleration Grid / Astigmatism Correction (G4)
6	Mesh Grids (G5, <u>G6</u>)
7	Deflection Plate Y2
9	Deflection Plate Y1

Pin	Connection
11	Deflection Plate X2
12	Grid <u>G2</u>
13	Deflection Plate X1
14	Heater (F)

Additionally, a separate side contact is provided for the post-acceleration anode ($G7, (L)$), which is connected via an integrated high-voltage cable with a minimum length of 350 mm. The horizontal screen axis is angularly offset by $13^{\circ} \pm 10^{\circ}$ relative to the mechanical alignment of the socket pins.

Interelectrode Capacitances

The direct interelectrode capacitances of the tube's primary elements are:

Capacitance Parameter	Value
Deflection plate X1 to all except X2 ($c_{x1}(x2)$)	4.2 pF
Deflection plate X2 to all except X1 ($c_{x2}(x1)$)	4.2 pF
Deflection plate Y1 to all except Y2 ($c_{y1}(y2)$)	3.1 pF
Deflection plate Y2 to all except Y1 ($c_{y2}(y1)$)	3.1 pF
X1 to X2 (c_{x1x2})	2.0 pF
Y1 to Y2 (c_{y1y2})	1.6 pF
Control grid G1 to all (c_{g1})	6.0 pF
Cathode K to all (c_k)	3.2 pF
Focusing electrode G3 to all (c_{g3})	5.0 pF

Typical Operating Conditions

Under standard operating conditions, all voltages are referenced to the cathode unless otherwise specified:

- **Post-acceleration Voltage ($U_{G7,(L)}$):** 16 kV
- **Mesh Electrode Voltage ($U_{G5G6/}$):** 2 kV (for optimal geometry)
- **First Acceleration Voltage (U_{G4}):** 2 kV
- **Grid 2 Voltage ($U_{[G2] (/tubes/G2)}$):** 2 kV

- **Mean Deflection Plate Potential (ΔU_{XY}):** 2 kV
- **Focusing Voltage (U_{G3}):** 400 to 800 V
- **Control Grid Voltage for Visual Extinction ($-U_{G1}$):** 45 to 90 V
- **Grid Drive Voltage for 10 μ A Screen Current (U_1):** Approx. 20 V
- **Horizontal Deflection Coefficient (d_x):** 7.7 V/cm $\pm 10\%$
- **Vertical Deflection Coefficient (d_y):** 3.6 V/cm $\pm 5\%$
- **Line Width (at screen center, $I_L = 10 \mu$ A):** Approx. 0.35 mm (measured via shrinking raster)

Deflection, Geometry, and Correction Systems

The 11D18HG utilizes double-electrostatic, symmetrical deflection. Symmetrical drive is mandatory; asymmetrical deflection voltages will introduce severe geometric distortion to the raster.

- **Orthogonality:** The nominal angle between the horizontal and vertical deflection axes is 90° .
- **Alignment Deviation:** The undeflected spot deviates from the physical center of the internal graticule by a maximum of 4 mm horizontally and 2 mm vertically.
- **Deflection Linearity:** Linearity deviation is limited to a maximum of 2% (measured at 25% and 75% of the useful deflection area).
- **Luminance Uniformity:** The decrease in brightness relative to the screen center is $\leq 30\%$ at a horizontal deflection of ± 60 mm, $\leq 30\%$ at a vertical deflection of ± 48 mm, and $\leq 50\%$ in any corner of the screen.
- **Permanent-Magnetic Correction:** A built-in permanent-magnetic electron-optical lens system automatically corrects angular deviations between the horizontal and vertical deflection axes, eccentricity, and spot astigmatism.
- **Image Rotation Correction Coil:** A factory-installed correction coil is secured to the tube using synthetic resin adhesive and adhesive tape. This coil has 1000 turns ($n = 1000$) and a nominal resistance of $185 \Omega \pm 25 \Omega$ at 20°C (with a temperature coefficient of $0.4\%/K$). A current of approximately 6.5 mA is required to rotate the image by $\pm 1^\circ$. To compensate for tube manufacturing tolerances ($\pm 5^\circ$) and residual geomagnetic fields after shielding ($\pm 2^\circ$), a maximum correction voltage of approximately 13 V is required.

Absolute Maximum Ratings

The following absolute maximum values must not be exceeded under any operating conditions:

Parameter	Maximum Value	Minimum Value
Post-acceleration Voltage ($U_{G7,(L)}$)	18 kV	—
Mesh Electrode Voltage ($U_{G5G6/}$)	3.3 kV	—

Parameter	Maximum Value	Minimum Value
First Acceleration and Astigmatism Correction Voltage ($UG4$)	3.3 kV	—
Focusing Voltage ($UG3$)	2.5 kV	—
Control Grid Voltage ($-UG1$)	200 V	0 V
Peak Grid Drive Voltage ($U1$, averaged over 1 ms)	25 V	—
Control Grid Leak Resistance ($RG1$)	1 M Ω	—
Specific Screen Load (PLM)	8 mW/cm ²	—
Voltage between Grids 2 and 4 ($\Delta U[G2]/(tubes/G2)/G4$)	2.0 kV	—
Voltage between Deflection Plates and Grids 4, 5, 6 ($\Delta U_{XY}/G4G5$)	500 V	—
Heater-to-Cathode Voltage (Heater Negative, $U-FK$)	125 V	—
Heater-to-Cathode Voltage (Heater Positive, $U+FK$)	125 V	—
Heater Filament Voltage (UFF)	6.6 V	6.0 V

Circuit Design and Alignment Guidelines

For optimal performance and minimal calibration effort, the mean potential of the horizontal deflection plates should equal the mean potential of the vertical deflection plates. Under this balanced condition, the tube operates within its specified limits without requiring external astigmatism or geometry correction.

If a circuit-induced constant difference between the mean potentials of the horizontal and vertical deflection plates is unavoidable (up to a limit of 50 V), the following compensation scheme must be implemented:

1. The mesh electrode voltage ($UG5/[G6]/(tubes/G6)$) must be set equal to the mean potential of the horizontal deflection plates.
2. The astigmatism correction voltage ($UG4$) must be adjusted to a negative value between 0 V and 25 V, referenced to the mean potential of the vertical deflection plates.
3. The voltage source supplying $UG4$ must exhibit a low internal resistance (≤ 10 k Ω).

Additionally, the external conductive coating (Außenaquadierung) and any magnetic shielding must be connected directly to the chassis ground.

Safety and X-Ray Radiation

When operated within its specified absolute maximum ratings ($U_{G7,(L)} \leq 18 \text{ kV}$ and beam current $I_L \leq 100 \mu\text{A}$), the X-ray dose rate of the 11D18HG remains well below the legally permitted limit of 36 pA/kg (0.5 mR/h). If voltages exceeding 5 kV are present, equipment designers must comply with relevant national radiation protection regulations (such as the German Röntgenverordnung of March 1, 1973).

Technical Summary

The **11D18HG** is a highly integrated, dual-acceleration oscilloscope CRT featuring a 16 kV post-acceleration system, a quick-heating 6.3 V cathode, and a flat 18 cm rectangular screen with an internal red graticule. With its high deflection sensitivity (7.7 V/cm horizontal, 3.6 V/cm vertical) and built-in permanent-magnetic and electromagnetic correction systems, it provides a compact, precise display solution for high-frequency oscilloscopes up to 75 MHz and data terminals.

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
fiir Kompakt	0	fir Kompakt-0Oszilloskope mit einer Bandbreite
Nachbeschleunigungsspannung UG7,(L) =	16 kV	Nachbeschleunigungsspannung UG7,(L) = 16 kV
Erste Beschleunigungsspanng. UG4 =	2	Erste Beschleunigungsspanng. UG4 = 2 kV
Nutzbare Ablenkflédche min., [1]	120	Nutzbare Ablenkflédche min., 120 mm x 96 mm
Nutzbare Ablenkflédche min., [2]	96	Nutzbare Ablenkflédche min., 120 mm x 96 mm
Spannung UF =	6.3 V	Spannung UF = 6,3V
Strom IF =	240 mA	Strom IF = 240 mA
Nachbeschleunigungs-AnschluB [1]	55	Nachbeschleunigungs-AnschluB 55 569 oder 53 597
Nachbeschleunigungs-AnschluB [2]	569	Nachbeschleunigungs-AnschluB 55 569 oder 53 597
Nachbeschleunigungs-AnschluB [3]	53	Nachbeschleunigungs-AnschluB 55 569 oder 53 597
Nachbeschleunigungs-AnschluB [4]	597	Nachbeschleunigungs-AnschluB 55 569 oder 53 597
Winkel zwischen der hor. und vert. Ablenkrichtung [1]	3	Winkel zwischen der hor. und vert. Ablenkrichtung: 3) 90°
Winkel zwischen der hor. und vert. Ablenkrichtung [2]	90	Winkel zwischen der hor. und vert. Ablenkrichtung: 3) 90°
Abweichung von der Ablenklinearitdt [1]	5	Abweichung von der Ablenklinearitdt: 5) max. 2 %
Abweichung von der Ablenklinearitdt [2]	2	Abweichung von der Ablenklinearitdt: 5) max. 2 %

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ablenkraster bei IL = [1]	10	Ablenkraster bei IL = 10 pA: ca. 0,35 mm
Ablenkraster bei IL = [2]	0.35	Ablenkraster bei IL = 10 pA: ca. 0,35 mm
Ablenkung * [1]	60	Ablenkung * 60 mm 30
Ablenkung * [2]	30	Ablenkung * 60 mm 30
Ablenkung * [1]	48	Ablenkung * 48 mm S 30 %
Ablenkung * [2]	30	Ablenkung * 48 mm S 30 %
Ablenkplatte X1 gegen\alle anderen Elektroden auBer X2 $c_{x1}(x2) =$	4.2	Ablenkplatte X1 gegen\alle anderen Elektroden auBer X2 $c_{x1}(x2) = 4,2$ pF
Ablenkplatte X2 gegen alle anderen Elektroden auBer X1 $c_{x2}(x1) =$	4.2	Ablenkplatte X2 gegen alle anderen Elektroden auBer X1 $c_{x2}(x1) = 4,2$ pF
Ablenkplatte Y1 gegen alle anderen Elektroden auBler Y2 $c_{y1}(y2) =$	3.1	Ablenkplatte Y1 gegen alle anderen Elektroden auBler Y2 $c_{y1}(y2) = 3,1$ pF
Ablenkplatte Y2 gegen alle anderen Elektroden auBer Y1 $c_{y2}(y1) =$	3.1	Ablenkplatte Y2 gegen alle anderen Elektroden auBer Y1 $c_{y2}(y1) = 3,1$ pF
Ablenkplatte X1 gegen X2 € [1]	1	Ablenkplatte X1 gegen X2 € $1 \times 2 = 2$ pF
Ablenkplatte X1 gegen X2 € [2]	2	Ablenkplatte X1 gegen X2 € $1 \times 2 = 2$ pF
Ablenkplatte Y1 gegen Y2 c_{y1y2}	1.6	Ablenkplatte Y1 gegen Y2 c_{y1y2} 1,6 pF
Steuergitter Gl gegen alle anderen Elektroden $c_{gl} =$	6	Steuergitter Gl gegen alle anderen Elektroden $c_{gl} = 6$ pF
Katode K gegen alle anderen Elektroden $c_y =$	3.2	Katode K gegen alle anderen Elektroden $c_y = 3,2$ pF
Heizspannung UF =	6.3 V	Heizspannung UF = 6,3 V
Heizstrom IF =	240 mA	Heizstrom IF = 240 mA
Heizzeit um	10	Heizzeit um 10 % des endlichen Katoden-
stromes bei Betriebseinstellung zu erreichen $t_y \sim$	65 A	stromes bei Betriebseinstellung zu erreichen $t_y \sim 65$ s
Nachbeschleunigungsspannung UG7 (L) = max	18 kV	Nachbeschleunigungsspannung UG7 (L) = max. 18 kV
Netzelektrodenspannung UG5G6/ = max	3.3 kV	Netzelektrodenspannung UG5G6/ = max. 3,3 kV
Astigmatismuskorrekturspannung UG4 = max	3.3 kV	Astigmatismuskorrekturspannung UG4 = max. 3,3 kV
Fokussierspannung UG3 = max.,	2.5 kV	Fokussierspannung UG3 = max., 2,5 kV

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Steuergitterspannung $-U_{G1} = \text{max}$	200 V	Steuergitterspannung $-U_{G1} = \text{max. 200 V}$
Gitter-Steuerspannung, Mittelwert iiber [1]	1 V	Gitter-Steuerspannung, Mittelwert iiber 1 ms $U_y = \text{max. 25 V}$
Gitter-Steuerspannung, Mittelwert iiber [2]	25 V	Gitter-Steuerspannung, Mittelwert iiber 1 ms $U_y = \text{max. 25 V}$
Steuergitter Ableitwiderstand $R_{G1} = \text{maXx}$	1	Steuergitter Ableitwiderstand $R_{G1} = \text{maXx. 1 MQ}$
Spannung zwischen den Gittern [1]	2 kV	Spannung zwischen den Gittern 2 und 4 $AUG2/G4 = \text{max. 2,0 kV}$
Spannung zwischen den Gittern [2]	4 kV	Spannung zwischen den Gittern 2 und 4 $AUG2/G4 = \text{max. 2,0 kV}$
Spannung zwischen den Gittern [3]	2 kV	Spannung zwischen den Gittern 2 und 4 $AUG2/G4 = \text{max. 2,0 kV}$
platte und den Gittern [1]	4	platte und den Gittern 4, 5 und 6 $AUXY/G4G5 = \text{max. 500 V}$
platte und den Gittern [2]	5	platte und den Gittern 4, 5 und 6 $AUXY/G4G5 = \text{max. 500 V}$
platte und den Gittern [3]	6	platte und den Gittern 4, 5 und 6 $AUXY/G4G5 = \text{max. 500 V}$
platte und den Gittern [4]	500	platte und den Gittern 4, 5 und 6 $AUXY/G4G5 = \text{max. 500 V}$
Spannung zwischen Heizfaden und Katode $U-FK = \text{max}$	125 V	Spannung zwischen Heizfaden und Katode $U-FK = \text{max. 125 V}$
Heizfadenspannung $UFF = \text{max}$	6.6 V	Heizfadenspannung $UFF = \text{max. 6,6 V}$
Bei Anlegen von Spannungen an Elektronenröhren von mehr als	5 kV	Bei Anlegen von Spannungen an Elektronenröhren von mehr als 5 kV oder bei Auftreten solcher Spannungen
Nachbeschleunigungsspannung	16 kV	Nachbeschleunigungsspannung 16 kV
Netzelektroden spannung	4 V	Netzelektroden spannung 4
Astigmatismuskorrekturspannung [1]	4 kV	Astigmatismuskorrekturspannung 4) 2 kV
Astigmatismuskorrekturspannung [2]	2 kV	Astigmatismuskorrekturspannung 4) 2 kV
Spannung an Gitter [1]	2 kV	Spannung an Gitter 2 2 kV
Spannung an Gitter [2]	2 kV	Spannung an Gitter 2 2 kV
Ablenkplattenpaare))	2	Ablenkplattenpaare)) 2 kV
Fokussierspannung	400...800 V	Fokussierspannung 400...800 v

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
einen Schirmstrom IL = [1]	10 A	einen Schirmstrom IL = 10 pA 20 v
einen Schirmstrom IL = [2]	20 A	einen Schirmstrom IL = 10 pA 20 v
mittlere Potential der vertikalen Ablenkplatten <	50	mittlere Potential der vertikalen Ablenkplatten < 50 V nicht vermeiden, muB
korrekturspannung) ist auf einen neg. Spannungswert zwischen	0...25 V	korrekturspannung) ist auf einen neg. Spannungswert zwischen 0...25 V
Published value [1]	5	5) gemessen bei 25 % und \$ 75 % der nutzbaren Ablenkung.
Published value [2]	25	5) gemessen bei 25 % und \$ 75 % der nutzbaren Ablenkung.
Published value [3]	75	5) gemessen bei 25 % und \$ 75 % der nutzbaren Ablenkung.

TUBE TINKER

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