



ELECTRONIC TUBE REFERENCE

12QR51

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

High-writing-speed electrostatic cathode-ray oscilloscope tube with a long-persistence green screen. It uses approximately 4 kV accelerating voltage and a 100 mm useful display area, retaining traces longer than the related short-persistence version.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	6.3 V / 700 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Cathode Ray	
MAXIMUM PLATE VOLTAGE	2200 V
<i>Cathode-ray electron-gun/deflection system; accelerating and deflection data published.</i>	

12QR51 — Electrostatic Deflection Cathode-Ray Tube

The **12QR51** is an all-glass cathode-ray tube manufactured by Tesla, designed for high-performance oscillograph applications. It is specifically engineered to provide low deflection plate capacitance, making it suitable for demanding measurement setups requiring high writing speeds and a long screen persistence.

Design and Physical Construction

The 12QR51 features an all-glass envelope with a nine-pin base on a 25 mm diameter. To minimize parasitic capacitances and facilitate high-frequency operation, the deflection plates are connected to

short, direct leads brought out through the side of the glass bulb. The accelerating anode (a_3) is similarly brought out via a side contact.

The tube utilizes electrostatic focusing and symmetrical electrostatic deflection. The screen is coated with a green phosphor characterized by a long persistence.

Physical Dimensions

- **Overall Length:** 390 ± 10 mm
- **Bulb Diameter:** $125^{+3}_{-1.5}$ mm
- **Neck Diameter:** 45 ± 1.5 mm
- **Distance from Base to Side Contacts:** 260 ± 10 mm
- **Distance from Base to Screen Transition:** 250 mm
- **Useful Screen Diameter:** 100 mm

Heater Characteristics

The tube incorporates an indirectly heated oxide cathode. The heater can be supplied by either alternating current (AC) or direct current (DC).

Parameter	Symbol	Value	Unit
Heater Voltage	U_f	6.3	V
Heater Current	I_f	0.7	A

Interelectrode Capacitances

The design minimizes deflection plate capacitances to optimize high-frequency performance. The maximum capacitance values are specified as follows:

Electrode Configuration	Symbol	Maximum Capacitance
Control electrode input capacitance	C_g	7 pF
Deflection plate <u>D1</u> to <u>D2</u> (all other electrodes grounded)	$C_{[D1](/tubes/D1)/[D2](/tubes/D2)}$	1.3 pF
Deflection plate D3 to D4 (all other electrodes grounded)	$C_{D3/D4}$	1.8 pF
Deflection plate <u>D1</u> to all other electrodes	$C_{[D1](/tubes/D1)}$	4.3 pF
Deflection plate D3 to all other electrodes	C_{D3}	6.0 pF

Electrode Configuration	Symbol	Maximum Capacitance
Plate <u>D1</u> to all other electrodes except <u>D2</u> (grounded)	$C[D1](/tubes/D1)$	2.7 pF
Plate <u>D2</u> to all other electrodes except <u>D1</u> (grounded)	$C[D2](/tubes/D2)$	3.0 pF
Plate D3 to all other electrodes except D4 (grounded)	$CD3$	3.5 pF
Plate D4 to all other electrodes except D3 (grounded)	$CD4$	4.1 pF
Cathode to all other electrodes	C_k	6.0 pF

Operating Values

The 12QR51 can be operated at different voltage levels depending on the required writing speed and deflection sensitivity. The typical operating points are defined at three accelerating anode voltage levels:

Parameter	Symbol	Operating Point 1	Operating Point 2	Operating Point 3	Unit
Accelerating Anode Voltage	U_{a3}	1500	3000	4000	V
Anode Voltage	U_{a2}	1500	1500	2000	V
Focusing Voltage (at $U_g = 75\%$ of cutoff)	U_{a1}	400	400	500	V
Cutoff Voltage	U_g	-60	-60	-80	V
Deflection Sensitivity (<u>D1</u> - <u>D2</u>)	$[D1](/tubes/D1)/[D2](/tubes/D2)$	0.8	0.62	0.48	mm/V
Deflection Sensitivity (D3 - D4)	$SD3/D4$	0.4	0.31	0.24	mm/V

Maximum Ratings and Operating Precautions

To ensure reliable operation and prevent damage to the tube, the following limiting values must not be exceeded:

- **Maximum Accelerating Anode Voltage (U_{a3}):** 4400 V
- **Maximum Anode Voltage (U_{a2}):** 2200 V
- **Maximum Focusing Voltage (U_{a1}):** 1100 V
- **Control Electrode Voltage (U_{g1}):** Maximum 0 V, Minimum -150 V
- **Maximum Voltage Ratio (U_{a3}/U_{a2}):** 2
- **Maximum Peak Voltage between Anode and any Deflection Plate (E):** 500 V
- **Maximum Grid Leak Resistance (R_g):** 1.5 M Ω
- **Maximum Deflection Plate Leak Resistance (R_D):** 3 M Ω
- **Maximum Heater-to-Cathode Voltage ($E_{k/f}$):** 125 V (DC or peak AC value)
- **Maximum Continuous Cathode Current (I_k):** 50 μ A
- **Maximum Screen Loading (W_s):** 3 mW/cm²

Mandatory Operating Precautions

1. **Cathode Preheating:** Cathode current must only be drawn after the heater has been active for at least 1 minute.
2. **Cathode Protection:** To protect the cathode, it is highly recommended to insert a resistor of approximately 200 k Ω in series with the cathode lead.
3. **Shielding:** Proper operation requires shielding the tube from external fields. Electrostatic fields must be shielded using an aluminum cover, while electromagnetic fields require a cover made of magnetically soft material.

Related Designations

The documentation notes that the related **12QR50** cathode-ray tube serves as a replacement for foreign types, specifically the **Mazda 30.C.2/P2** and the **OE 411 PAV**.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X Tesla

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

195X TESLA

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
AcceleratingVoltage	4000 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
UsefulScreenDiameter	100 mm	—

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