

Dieter's Nixie Tube Data Archive

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Thank you!

Document in this file	Philips datasheet – Z504S tube
Display devices in this document	Z504S

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

(initial and during life)

IGNITION REQUIREMENTS

Anode supply voltage	V_{ba}	375 to 1000 V
Time constant rise of anode supply voltage when switching on		
$V_{ba} < 550$ V		1.0 ms ¹⁾
$V_{ba} > 550$ V		6.0 ms ¹⁾

DISCHARGE AT REST ON A MAIN CATHODE

Maintaining voltage of anode to main cathode at $I_a = 340 \mu A$, $V_{gdB} = 25$ to 50 V		See also page 8
maximum	V_m	max. 205 V
minimum	V_m	min. 185 V
Cathode current		
maximum (except during reset)	I_k	max. 525 μA
minimum	I_k	min. 250 μA
recommended	I_k	340 μA
Guide supply voltage		
maximum	V_{bgd}	max. 60 V
minimum	V_{bgd}	min. 25 V
Resistance between guides and guide supply	R_{gd}	max. 220 k Ω
Cathode potential (except during reset)		
Non conducting cathode	$-V_k$	max. 14 V
Conducting cathode	V_k max. V_{gd}	min. 10 V ²⁾
	$-V_k$	max. 0 V

For notes see page 5

STEPPING REQUIREMENTS

See also pages 6 and 7

Discharge dwell time

main cathode	min.	75 μ s
guide A cathode	min.	60 μ s
guide B cathode	min.	60 μ s

Interval between trailing edge of
guide A pulse and leading edge
of guide B pulse (double rectangular pulse drive)

max. 3 μ s

Negative guide voltage to step the
discharge from a main cathode to
an adjacent guide cathode

max. 140 $V_{\text{minus}V_{\text{gd}}}$
min. 45 V

Voltage difference required to step the
discharge from a guide cathode to the
adjacent guide cathode

max. 140 V
min. 45 V ³⁾

Positive supply voltage to step the
discharge from a guide cathode to the
adjacent main cathode

max. 50 V
min. 25 V

Main cathode potential

Non conducting cathodes

$-V_k$ max. 14 V

Conducting cathode

V_k V_{gd} minus 10 V ²⁾

$-V_k$ max. 0 V

For notes see page 5

RESETTING REQUIREMENTS

	Reset to cathodes	
	7, 8, 9, 0, 1, 2, 3	4, 5, 6
Main cathode voltage	$-V_k$ max. 240	140 V
pulse duration > 1 ms	$-V_k$ min. 120	120 ⁴⁾ V
pulse duration $\geq 200 \mu s$	$-V_k$ min. 130	- V
Pulse duration	min. 200	- μs
Reset cathode current	I_k max. 800	650 μA ⁵⁾

LIFE AND RELIABILITY

With this tube an average failure rate of less than 0.5%/1000 h has been obtained. When operated continuously this failure rate applies for a period in excess of 25 000 h, but the visual read-out may be impaired after the first 15 000 h. These figures have been obtained under the following typical conditions:

Anode current	340 μA
Positive guide supply voltage	40 V
Negative guide voltage for transfer	80 V
Output cathode (k_0) voltage	
non conducting	-12 V
conducting	0 V
Guide A dwell time	110 μs
Guide B dwell time	250 to 650 μs
Counting speed	0.2 p.p.h. to 500 p.p.s.
Ambient temperature	20 ± 5 °C

A typical tube can be expected to count correctly with the above conditions after standing on one main cathode for a period up to 4500 h.

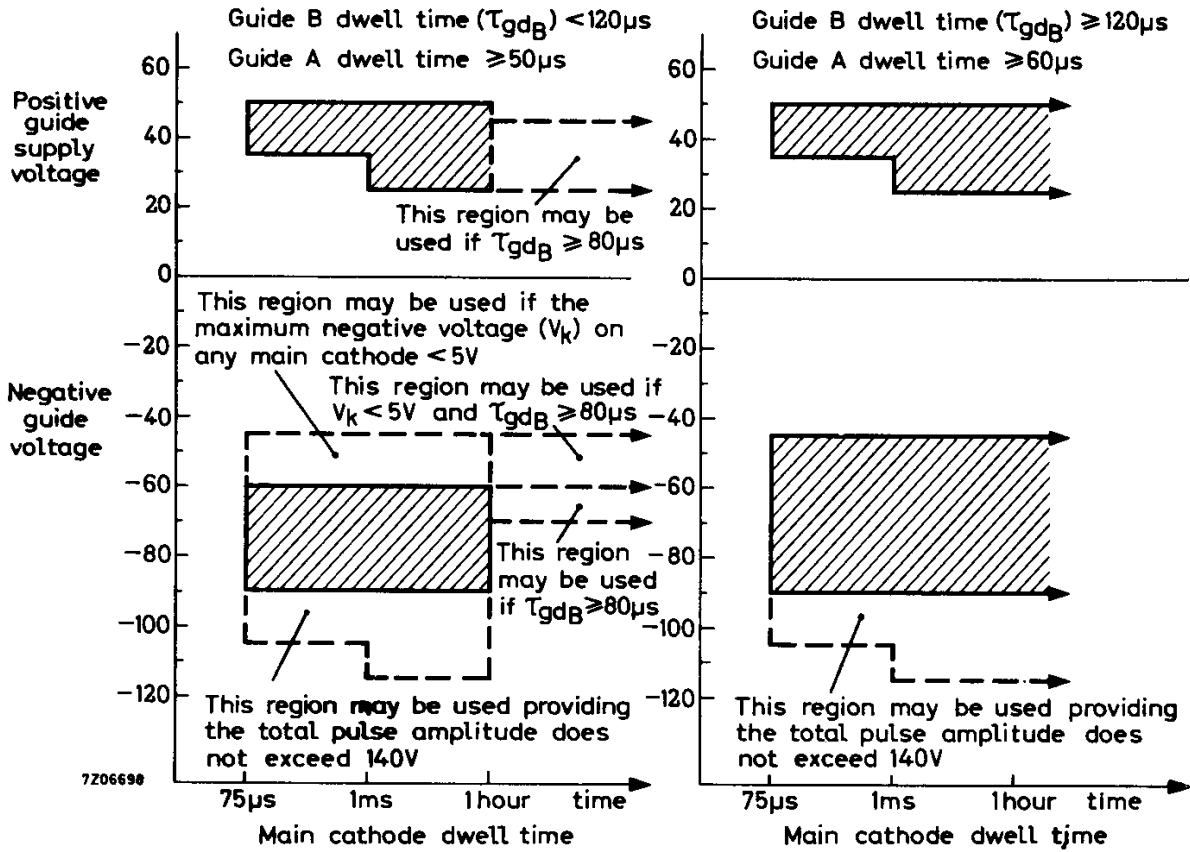
For notes see page 5

LIMITING VALUES (Absolute maximum rating system)

Continuous main cathode current (except during reset)	I_k	max. 525 μA
Reset cathode current		
Cathodes 7, 8, 9, 0, 1, 2, 3	I_k	max. 800 μA ⁵⁾
Cathode 4, 5, 6	I_k	max. 650 μA ⁵⁾
Voltage between any two main or guide cathodes (except during reset)		max. 140 V
Positive guide supply voltage	$V_{b_{gd}}$	max. 140 V
Ambient temperature, operation and stand-by	t_{amb}	max. 50 $^{\circ}\text{C}$ ⁶⁾

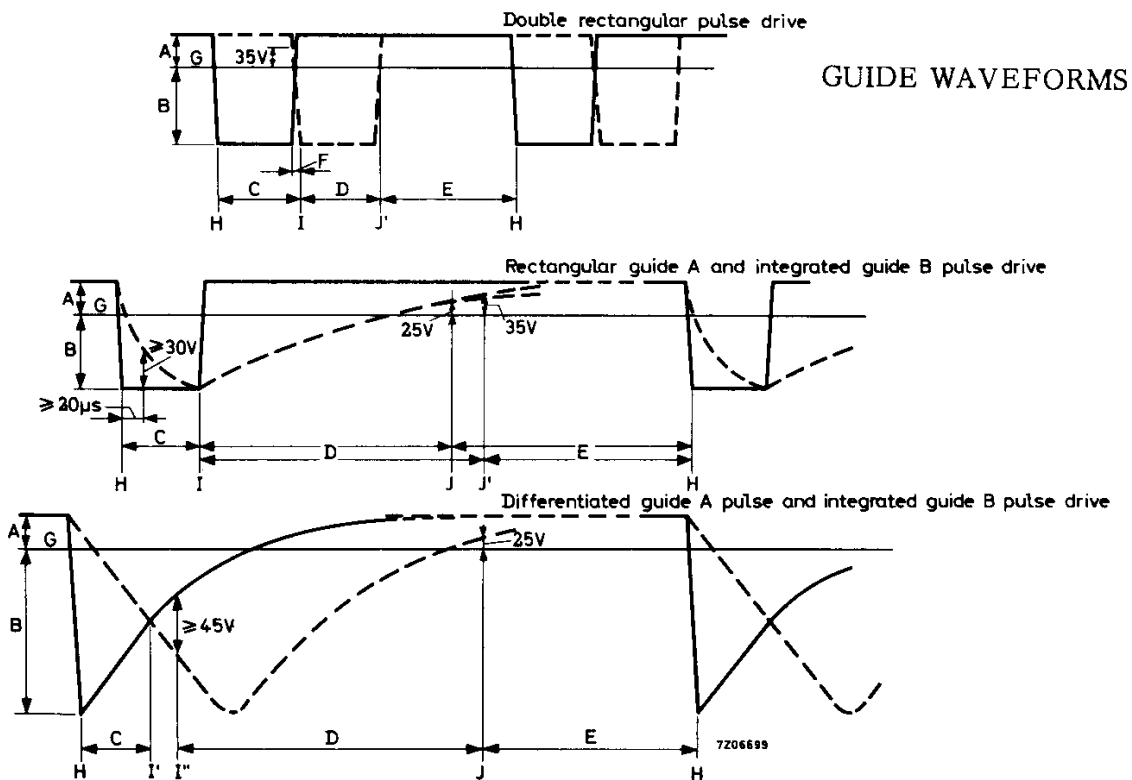
NOTES

1. If the power supply does not have a suitable time constant as one of its characteristics, it can be conveniently obtained by inserting a resistor in series with the supply voltage and a capacitor to earth (4.7 k Ω and 0.25 μF for 1.0 ms, 6.8 k Ω and 1.0 μF for 6.0 ms).
2. This value should not exceed 40 V.
3. The adjacent guide cathode (the cathode to which the discharge is being transferred) must also be 45 V negative with respect to the most positive main cathode supply voltage.
4. For cathodes 4, 5 and 6, the leading edge of the resetting pulse should have a rate of fall not exceeding 140 V per ms. Resetting will occur within 1 ms after the voltage has reached 120 volts.
5. The high current permitted during reset should not be allowed to flow for more than a few seconds.
6. It is preferable to store the tube as near as possible to room temperature.

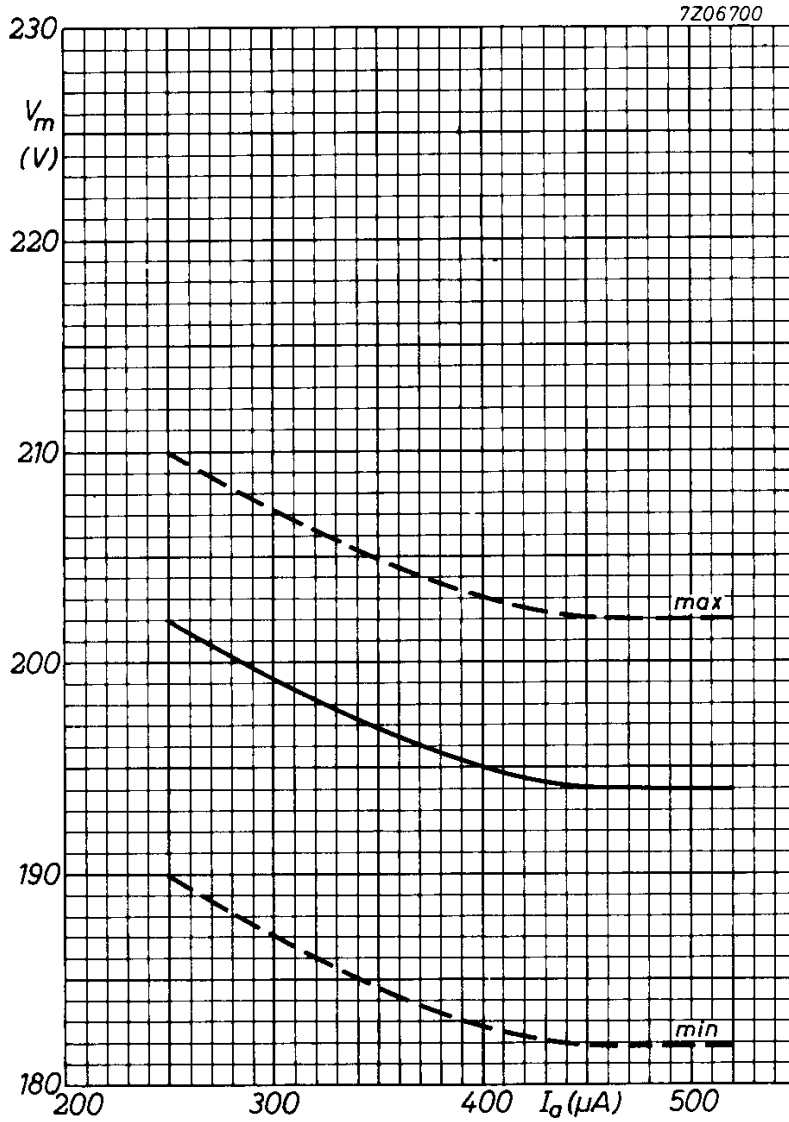


GUIDE OPERATING VOLTAGES

The shaded areas represent regions where the tube may be used without restriction initially and during life



- A Positive guide supply voltage
- B Negative guide supply voltage
- C Guide A dwell time
- D Guide B dwell time
- E Main cathode dwell time
- F Interval between trailing edge of guide A pulse and leading edge of guide B pulse
- G Potential of most positive main cathode supply voltage
- H Discharge transfers from main cathode to guide A cathode
- I Discharge transfers from guide A cathode to guide B cathode
- I' Earliest instant for discharge transfer from guide A cathode to guide B cathode
- I'' Latest instant for discharge transfer from guide A cathode to guide B cathode
- J Latest instant for discharge transfer from guide B cathode to main cathode, for a main cathode dwell time > 1 ms
- J' Latest instant for discharge transfer from guide B cathode to main cathode dwell time ≤ 1 ms



Anode to main cathode maintaining voltage plotted against anode current