Dieter’s

Nixie Tube Data Archive

This file is a part of Dieter's Nixie- and display tubes data archive

If you have more datasheets, articles, books, pictures or other information about Nixie tubes or other display devices please let me know.
Thank you!

Document in this file	Philips datasheet – ZM1162
Display devices in this document	ZM1162

File created by Dieter Waechter
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INDICATOR TUBE

Long life cold cathode ten digit numeral indicator tube for top viewing.
The rectangular envelope allows for close tube-to-tube spacing, both in the horizontal and vertical axes.

QUICK REFERENCE DATA				
Numeral height			15.5	mm
Numerals	1 2 3 4 5 6 7 8 9 0			
Supply voltage	V_{ba}	min.	170	V
Cathode current	I_k		2.5	mA
Distance between mounting centres		min.	20	mm
Viewing angle			90	o

GENERAL

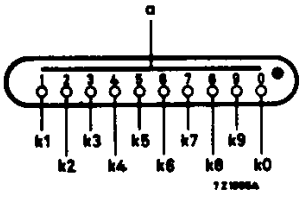
The numerals are 15.5 mm high and appear on the same base line allowing in-line read out.

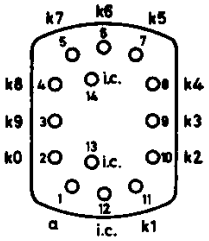
PRINCIPLE OF OPERATING

The tube contains ten cathodes in the form of ten figures and one common anode. By applying a suitable voltage between the anode and one of the ten cathodes the corresponding figure will be covered by a red neon glow.

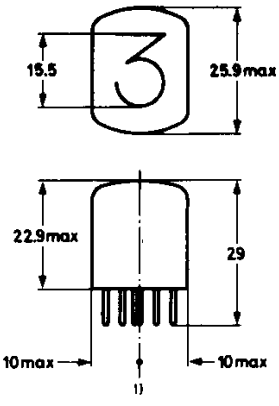
DIMENSIONS AND CONNECTIONS

Dimensions in mm





special 14 pin base



1) Centre line through pins 6 and 12 (Note: distance between centre lines of adjacent tubes must be at least 20 mm)

Mounting position: any

The numerals are viewed through the top of the envelope. The numerals will appear upright (within $\pm 3^0$) when the tube is mounted with the line through pins 6 and 12 vertical, pin 6 uppermost.

Accessory

Socket	type	55705

CHARACTERISTICS AND OPERATING CONDITIONS (at 20 °C to 50 °C)

Ignition voltage	V_{ign}	min. 170	V
Ignition delay		see page 3	
Maintaining voltage		see page 4	
Cathode current, recommended	I_k	2.5	mA
Cathode current for coverage average during any conduction period	I_k	min. 1.5	mA
D.C. operation		see pages 5 to 9	
Extinguishing voltage	V_{ext}	118	V

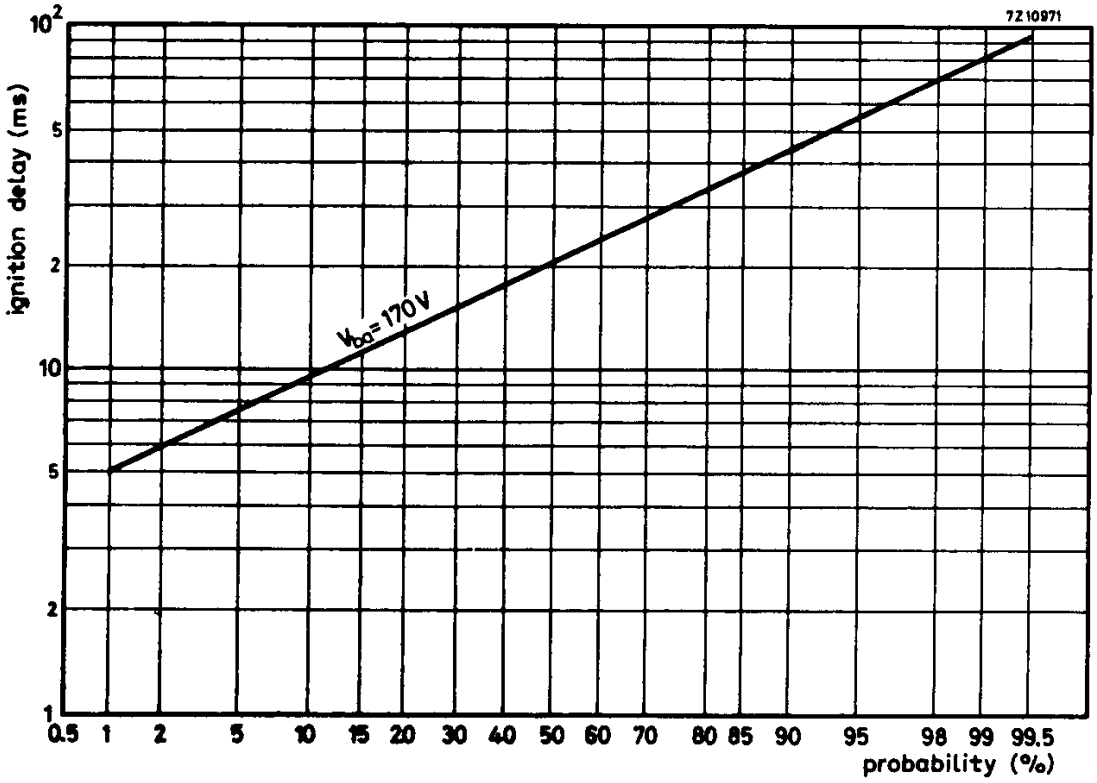
LIFE EXPECTANCY at I_k = 2.5 mA and room temperature 1)

Continuous display of one numeral	> 5 000	h
Sequentially changing the display from one numeral to another, every 100 hrs or less	> 30 000	h

LIMITING VALUES (Absolute max. rating system)

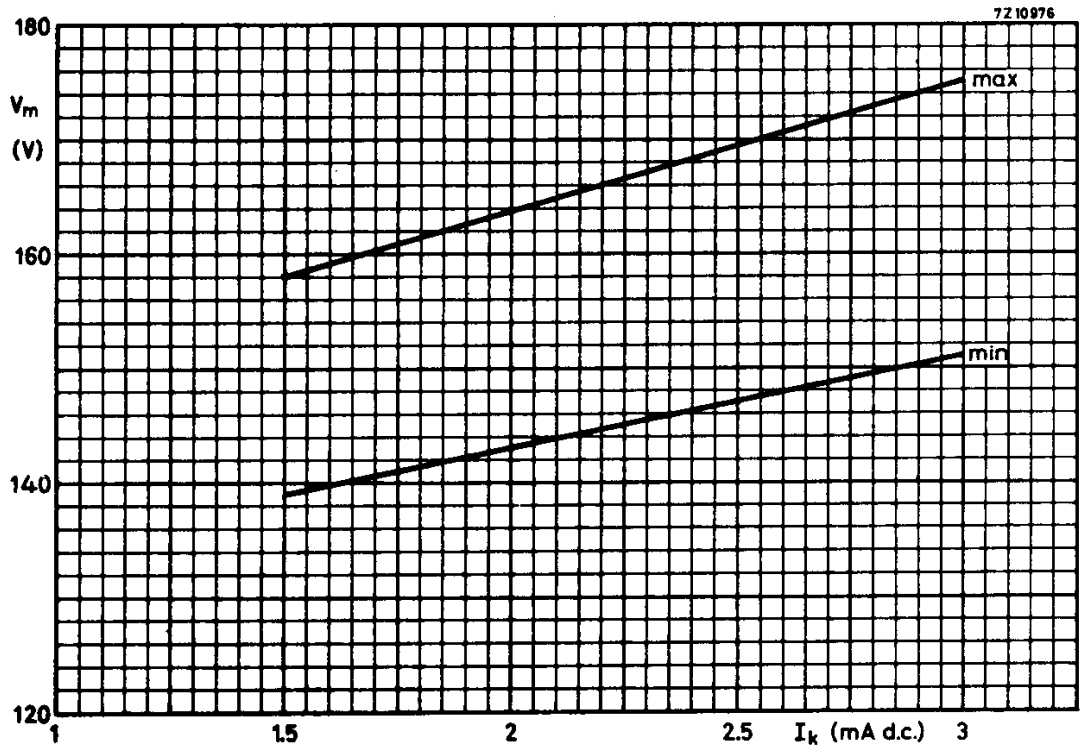
Cathode current (each digit),			
average, T_{av} = max. 20 ms	I_k	max. 3.0	mA
peak	I_{kp}	max. 3.5	mA
average during any conduction period	I_k	min. 1.5	mA
Anode voltage necessary for ignition	V_a	min. 170	V
Bulb temperature	t_{bulb}	max. +70	°C
	t_{bulb}	min. -10	°C 1)

1) For bulb temperatures below +10 °C the life expectancy of the tube is substantially reduced.



CUMULATIVE DISTRIBUTION OF IGNITION DELAY

This curve shows the probability that a tube will ignite in less than the time shown after a non-conduction period of a few seconds. The ignition delay will be appreciably reduced when the interval between conduction periods is less than 100 milliseconds. In general, an increase in the supply voltage will reduce the ignition delay.

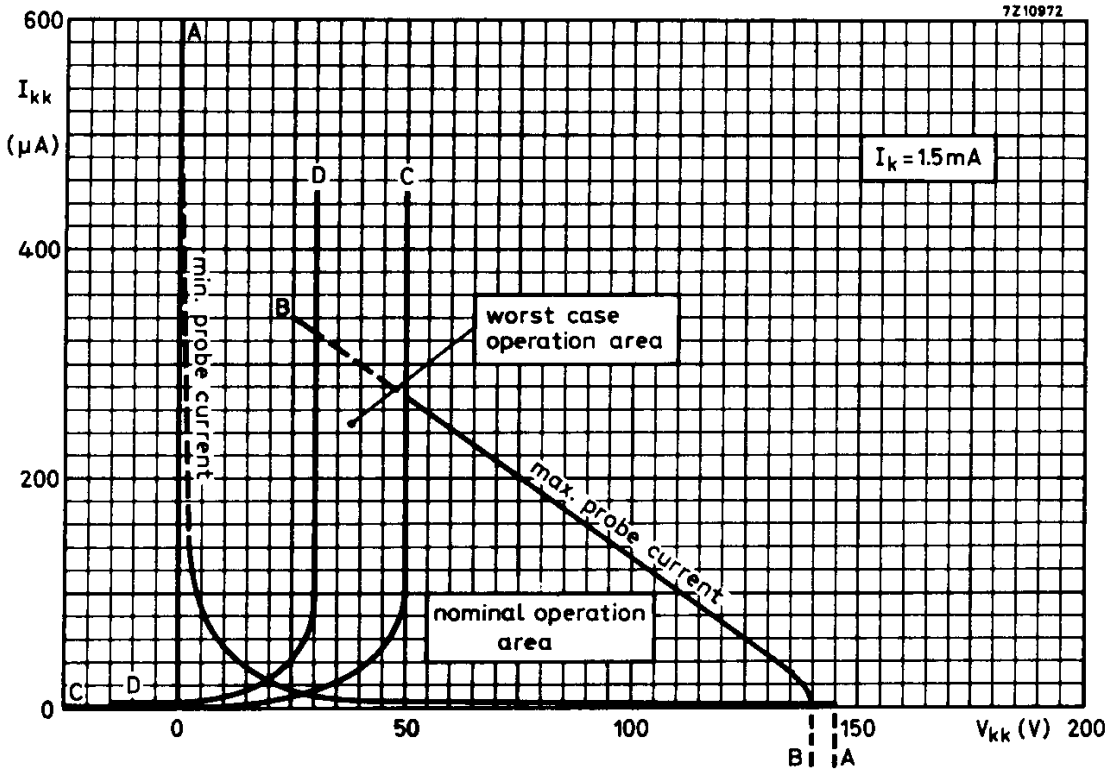


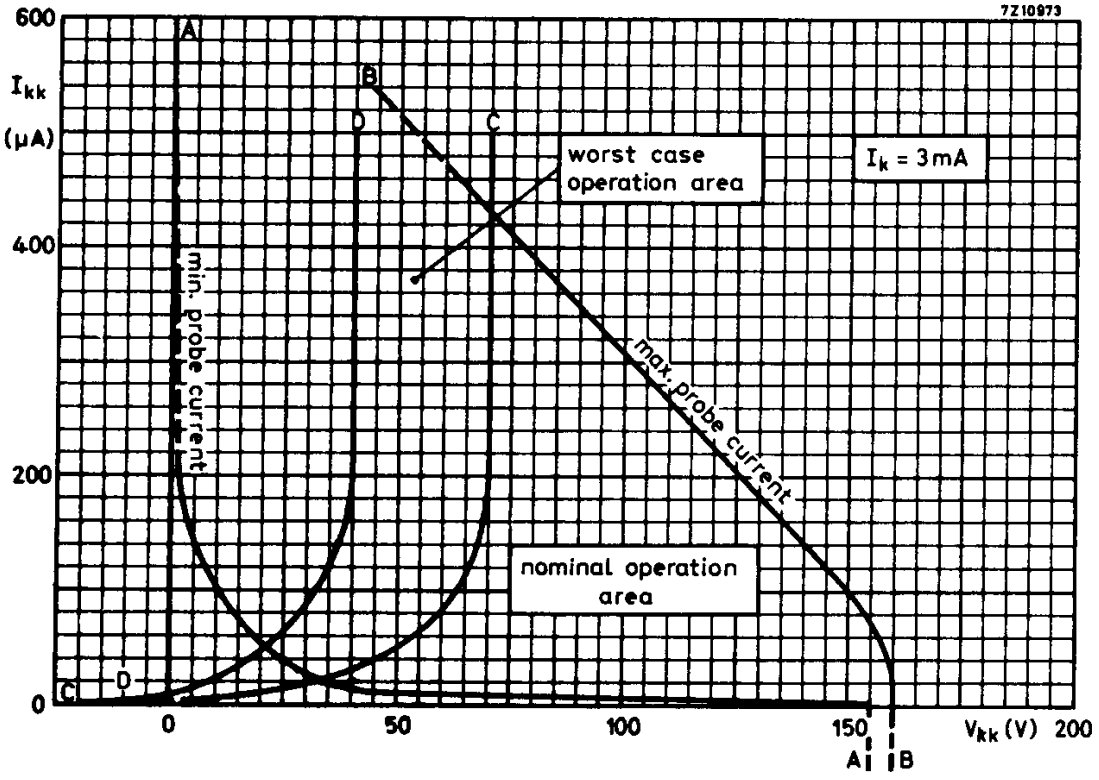
ANODE-TO-CATHODE MAINTAINING VOLTAGE
AS A FUNCTION OF CATHODE CURRENT

NOTE

PROBE CURRENT CURVES

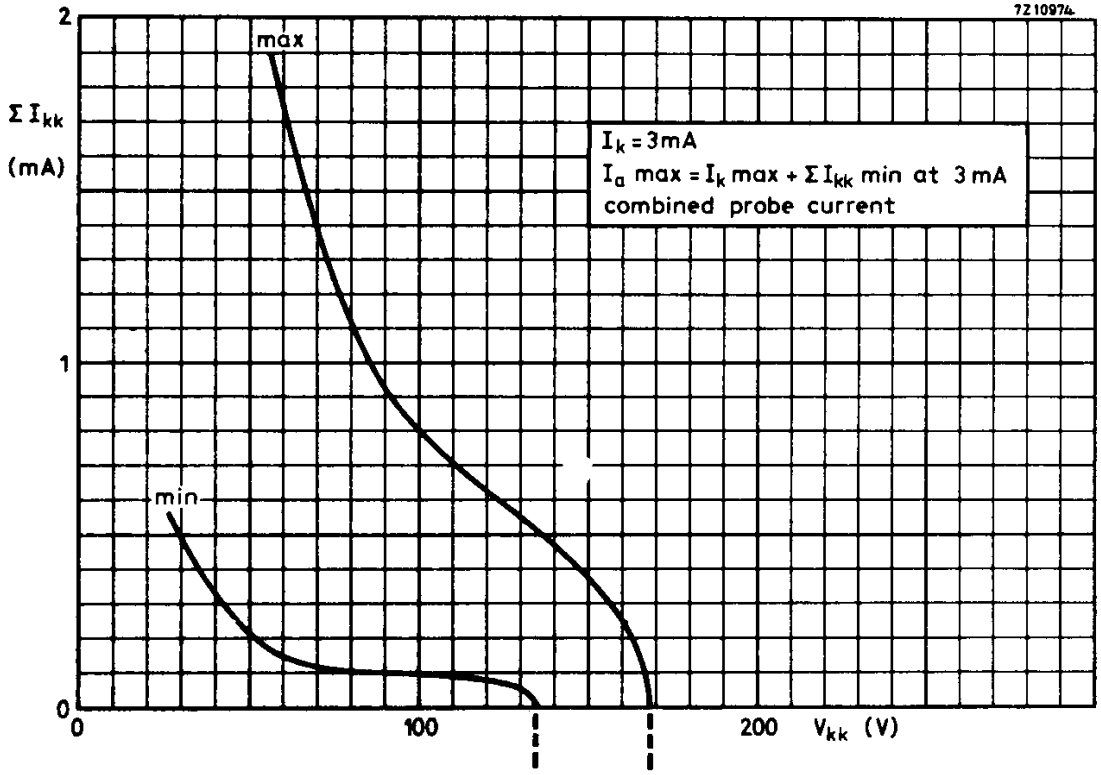
For low cathode selecting voltages (V_{kk}) the current I_{kk} to the non-conducting cathode will increase, and the readability of the conducting cathode will be affected. It is therefore recommended to use a nominal operating point to the right of line C-C. Under the worst operating conditions the operating point should never reach the area left of the line D-D.

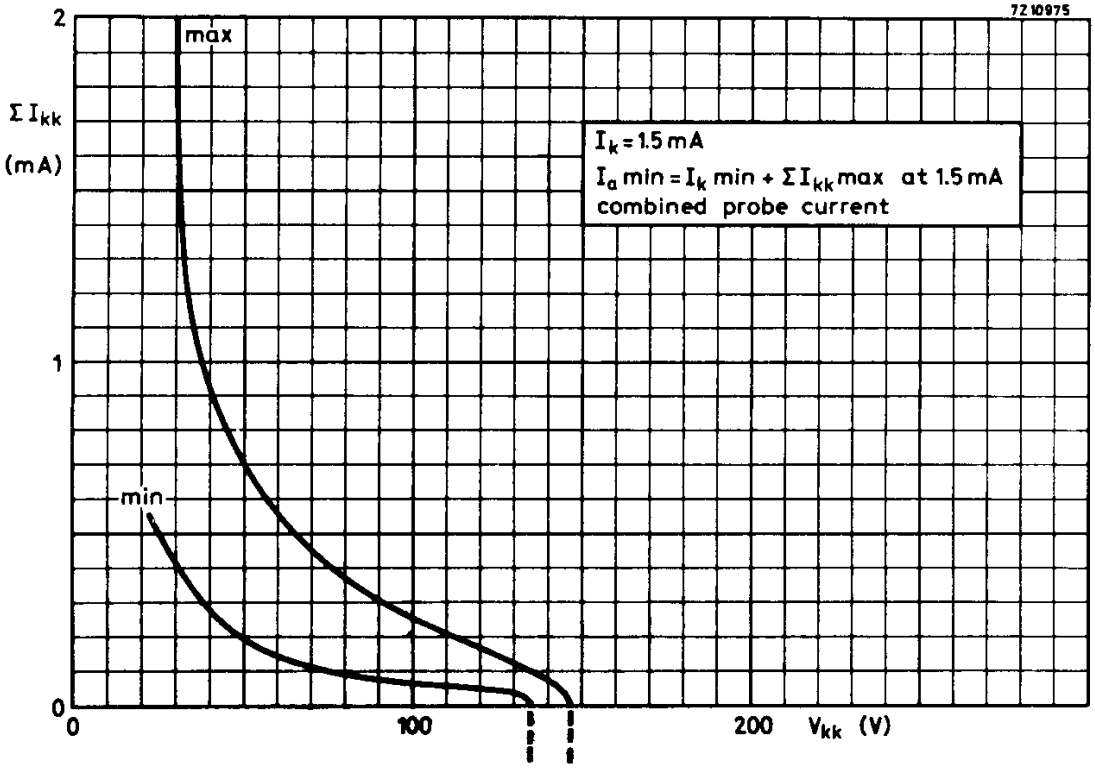




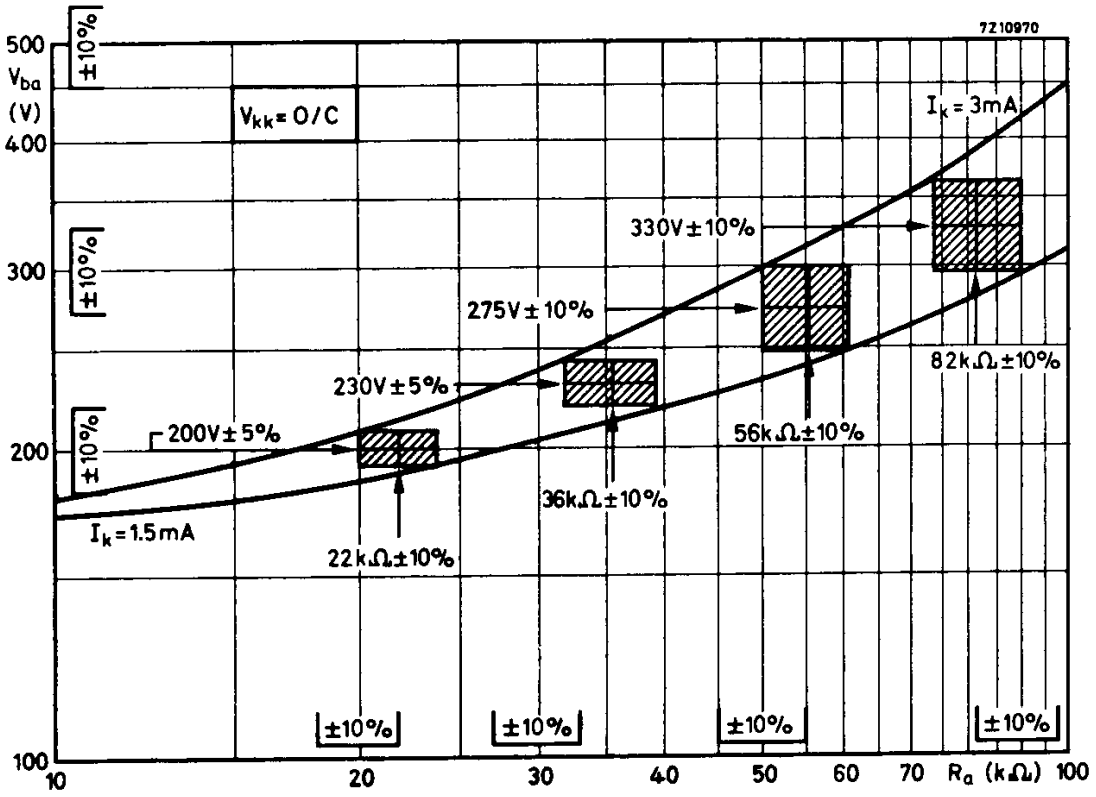
PROBE CURRENTS TO INDIVIDUAL NON-CONDUCTING CATHODES

See note page 4





COMBINED PROBE CURRENT TO ALL NON-CONDUCTING CATHODES



D.C. SUPPLY VOLTAGE AS A FUNCTION OF ANODE LOAD RESISTOR:

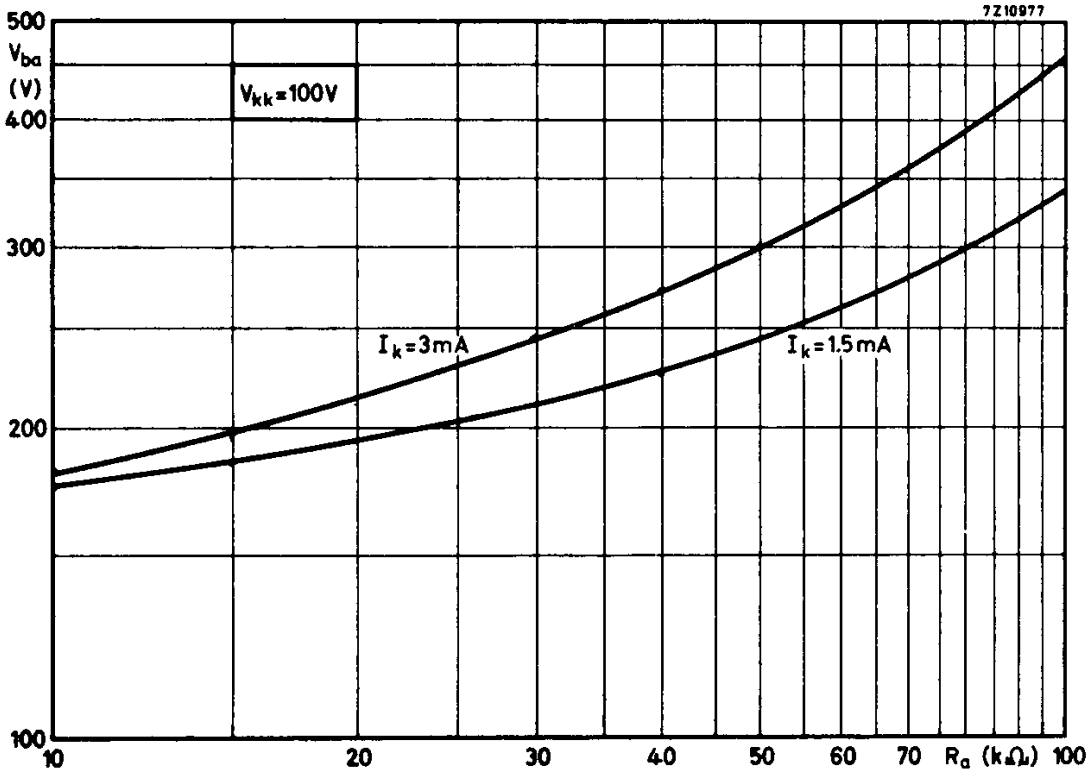
NON-CONDUCTING CATHODES OPEN CIRCUIT

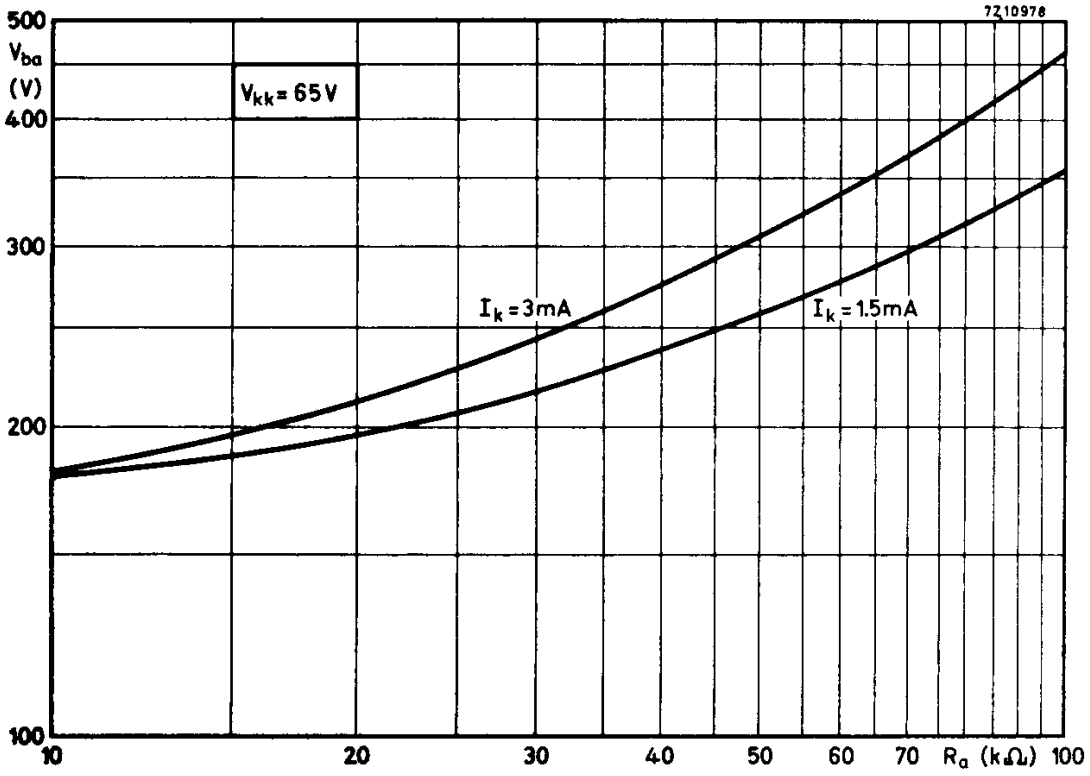
NOTE - SUPPLY VOLTAGE/LOAD RESISTOR

The graphs on pages 7 to 9 give the relationship between the d.c. anode supply voltage and the required anode load resistor for fixed values of V_{kk} (voltage difference between conducting and non-conducting cathodes).

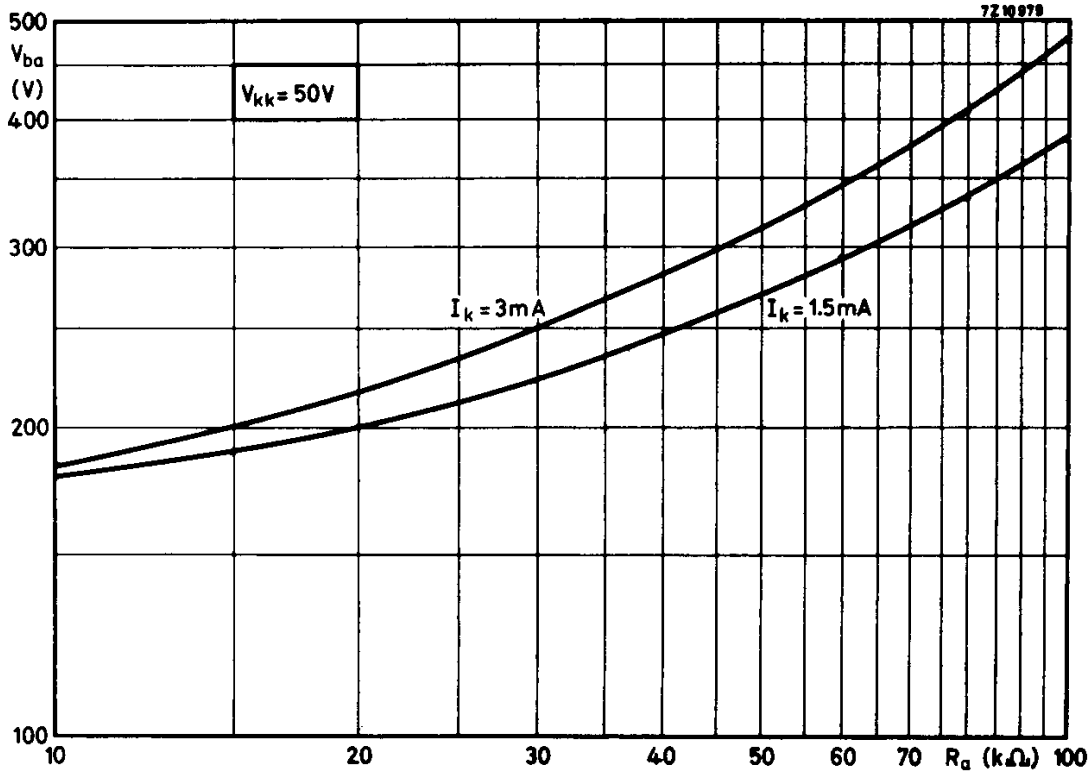
Each graph is plotted on log-log graph paper; therefore a given tolerance expressed as a percentage can be represented as a fixed length at any point on the x and y axis. This is shown on the graph above by taking points on each axis with a fixed tolerance. Examples are shown on the graph above of the supply voltages and load resistors with tolerances expressed as a percentage so as to remain within the recommended operating region.

On page 9 details are given of the method of calculating corresponding values of supply voltage and anode load resistor, for fixed values of V_{kk}.





D.C. SUPPLY VOLTAGE AS A FUNCTION OF ANODE LOAD RESISTOR



D.C. SUPPLY VOLTAGE AS A FUNCTION OF ANODE LOAD RESISTOR

NOTE - The supply voltage/load resistor curves are derived from:

$$V_{ba} = I_a . R_a + V_m \text{ (General formula)}$$

$$V_{ba} = \left[I_k + \Sigma I_{kk}\right] R_a + V_m$$

The value of I_{kk} will depend on the bias voltage V_{kk}.

Supply voltage required to work above the minimum value of I_k:

$$V_{ba} = \left[1.5 \text{ mA} + \Sigma I_{kk} \text{ max. at } I_k = 1.5 \text{ mA}\right] R_a + 158 \text{ V}$$

Supply voltage required to work below the maximum value of I_k:

$$V_{ba} = \left[3.0 \text{ mA} + \Sigma I_{kk} \text{ min. at } I_k = 3.0 \text{ mA}\right] R_a + 151 \text{ V}$$