INDICATOR TUBE

Cold cathode ten digit numeral indicator tube for side viewing.

QUICK REFERENCE DATA				
Numeral height			30	mm
Numerals	1 2 3 4 5 6 7 8 9 0			
Supply voltage	V_{ba}	min.	170	V
Cathode current	I_k		4.5	mA

GENERAL

The numerals are 30 mm high and appear on the same base line allowing in-line read out. The ZM1040 is provided with a red contrast filter.

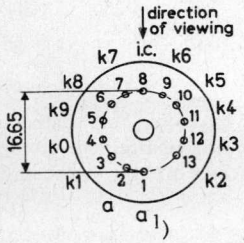
PRINCIPLE OF OPERATION

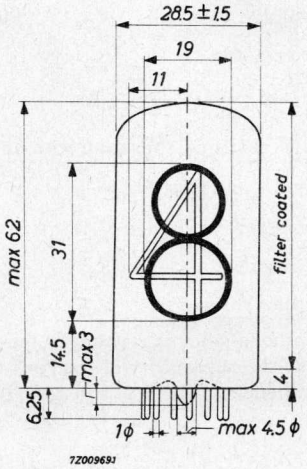
The tube contains ten cathodes in the form of ten figures and one common anode. By applying a suitable voltage between the anode and one of the ten cathodes the corresponding numeral will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B





1) Pins 1 and 2 to be interconnected externally.

Mounting position: any

The numerals are viewed through the side of the envelope. The numerals will appear upright (within 1.5°) when the tube is mounted vertically.

Accessories		
Socket	type	2422 505 00001 or 2422 505 00002

CHARACTERISTICS AND OPERATING CONDITIONS

Ignition voltage	V_{ign}	max.	170	V
Maintaining voltage	V_m	see page B45		
Cathode current for coverage,				
average, during any conduction period	I_k	min.	3	mA
Cathode current,				
average (T_{av} = 20 ms)	I_k	max.	6	mA
peak	I_{k_p}	max.	20	mA
Cathode selecting voltage	V_{kk}	see page B46		
Extinguishing voltage	V_{ext}	min.	120	V

Typical operation at temperatures t_{amb} = 10 to 50 °C

D.C. operation with or without V_{kk}

(See fig.1 and 3 and pages B45 and B46)

Anode supply voltage	V_{ba}	200	250	300	350	V
Maintaining voltage	V_m	140±10	140±10	140±10	140±10	V
Anode series resistor	R_a	15	27	39	47	kΩ
Cathode selecting voltage	V_{kk}			min.	60	V [1]

A.C. half-wave rectified operation with or without V_{kk}

(See fig.2 and 4 and page B45)

Secondary transformer voltage	V_{tr}	170	220	250	300	V
Anode series resistor	R_a	5.6	12	18	27	kΩ
Cathode selecting voltage	V_{kk}			min.	60	V [1]

[1] With low cathode selecting voltages the current I_{kk} to the "off" cathodes will increase and the readability of the "on" cathode will be affected. It is therefore recommended to use a voltage V_{kk} in excess off the stated minimum value.

LIFE EXPECTANCY at I_k = 4.5 mA

Sequentially changing the display from one digit to the others every 1000 hours or less			100 000	h

LIMITING VALUES (Absolute max. rating system)

Anode voltage necessary for ignition	V_a	min.	170	V
Cathode current,				
average during any conduction period	I_k	min.	3	mA
average (T_{av} = 20 ms)	I_k	max.	6	mA
peak	I_{k_p}	max.	20	mA
Cathode selection voltage	V_{kk}	min.	60	V
Bias voltage between anode and "off" cathodes	V_{bias}	max.	120	V
Bulb temperature	t_{bulb}	min. max.	0 +70	°C 1) °C

SHOCK AND VIBRATION

An indication for the ruggedness of the tube is the fact that 95% of the items sampled from the normal production line pass the shock and vibration tests specified below without perceptible damage.

Shock: 25 g_{peak}, 1000 shocks in one of the three positions of the tube.

Vibration: 2.5 g_{peak}, 50 Hz, during 32 hours in each of the three positions of the tube.

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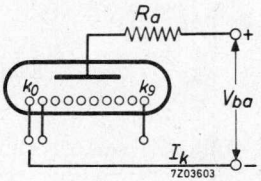
1) Bulb temperatures below 0 °C result in a reduced life expectancy and changes in characteristics (see page B47)
In designing equipment to be used over a wide temperature range the use of "constant current operation" (high supply voltage with a high anode series resistor) is recommended.

Fig.1



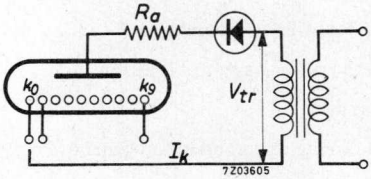


Fig.2

Fig.3

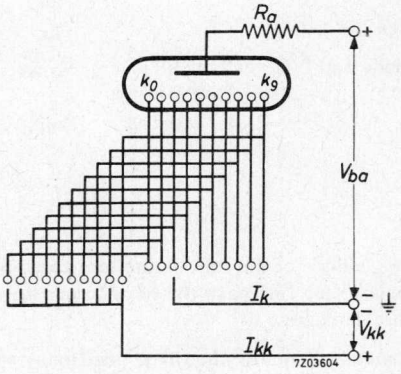
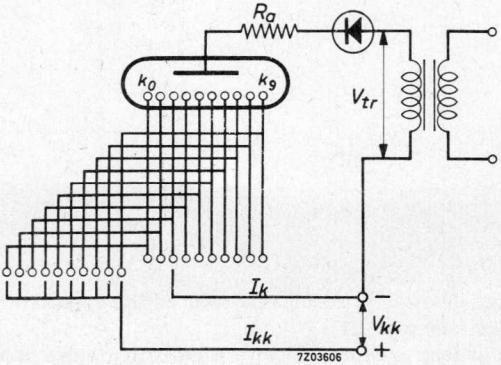
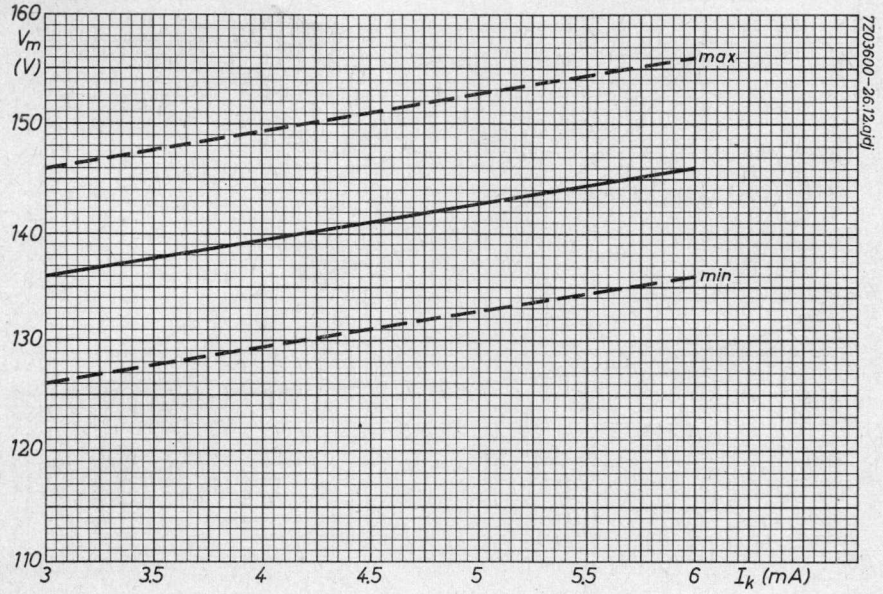
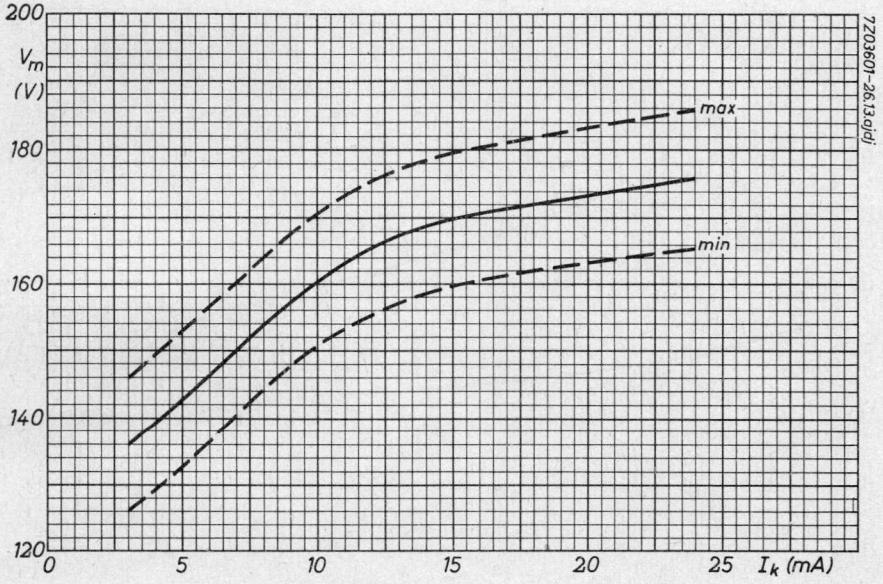
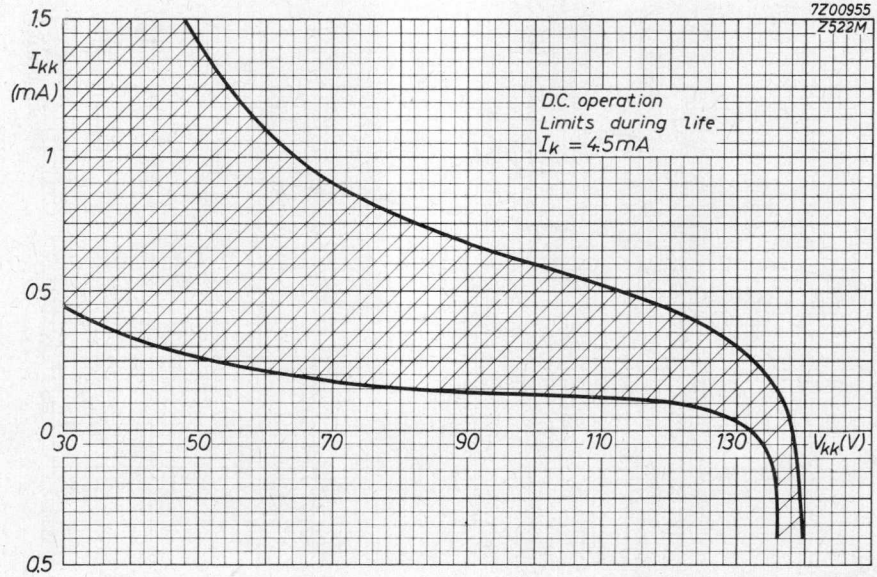


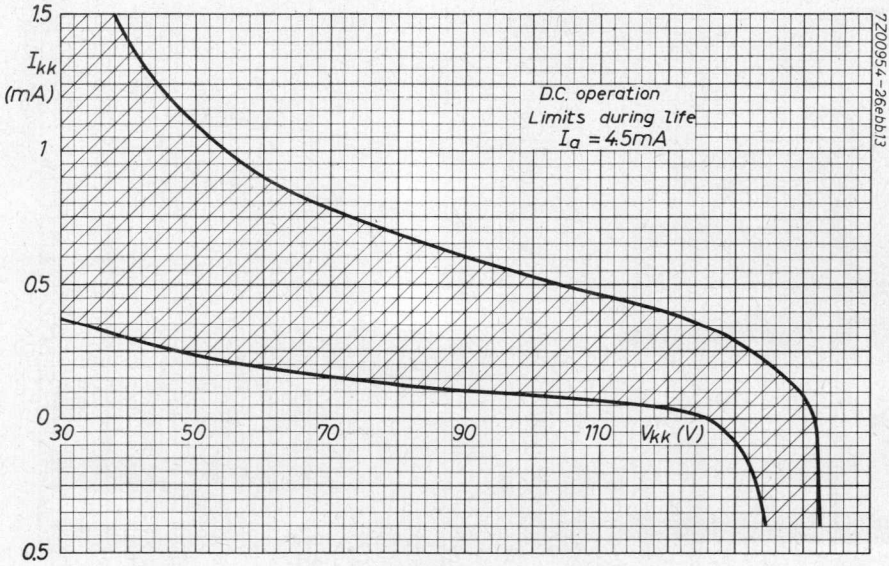
Fig.4

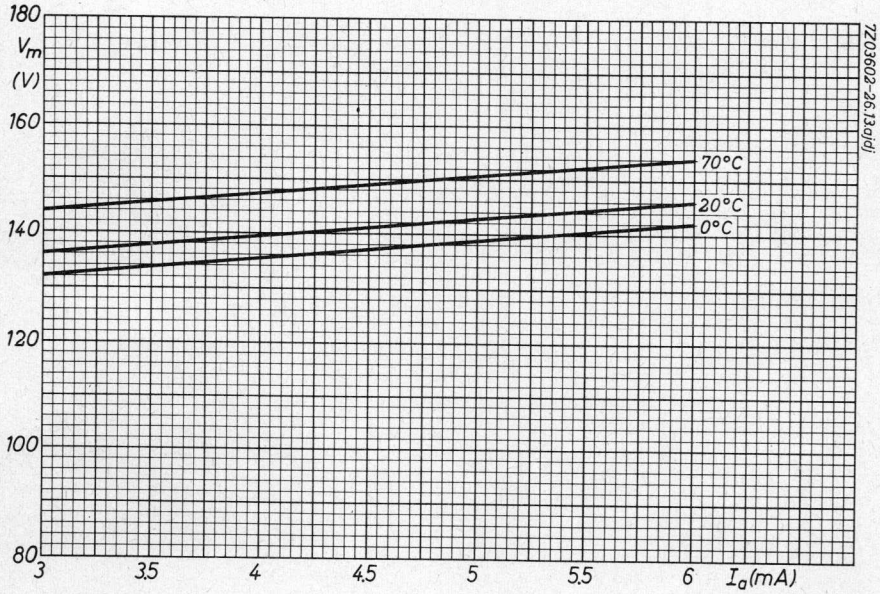



160
V_m
(V)
150
140
130
120
110
3
3.5
4
4.5
5
5.5
6
I_k (mA)
max
min
7Z03600-26.12.ajdj


200
V_m
(V)
180
160
140
120
0
5
10
15
20
25
I_k (mA)
max
min
7Z03601-26.13.ajdj


7Z00955
Z522M
1.5
I_{kk}
(mA)
1
0.5
0
0.5
30
50
70
90
110
130
V_{kk}(V)
D.C. operation
Limits during life
I_k = 4.5mA


1.5
I_{kk}
(mA)
1
0.5
0
0.5
30
50
70
90
110
V_{kk} (V)
D.C. operation
Limits during life
I_a = 4.5mA
7Z00954-26ebb13


180
V_m
(V)
160
140
120
100
80
3
3.5
4
4.5
5
5.5
6
I_a(mA)
70°C
20°C
0°C
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