

DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not necessarily imply that the device will go into regular production.

ZM1560

7-SEGMENT INDICATOR TUBE

- Suitable for direct drive with 30 V ICs, fast ignition type

Long-life segmented cold-cathode gas-filled indicator tube in a flat envelope for in-line numeric display applications, such as in digital measuring equipment, clocks, cash registers, weighing and pin-ball machines etc. The tube is suitable for soldering into the circuit and the connection terminals are positioned in such a way that the units can be mounted side by side without loss of space. The tube contains less than 5,5 kBq (150 nCi) promethium 147.

QUICK REFERENCE DATA

Character height	26,1 mm
Characters	formed by 7 segments
Number of decades	1
Decimal point	to the lower right of the character
Decade pitch for stacked tubes	min. 25,4 mm (1 in)

MECHANICAL DATA

Mounting position: any

The tube is provided with dual in-line tinned dip-solder pins for insertion in a printed-wiring board ($e = 2,54$ mm). It may also be plugged into a socket.

Mechanical strength

The robustness of the pins is tested according to IEC 68-2-21, test 3.4.2.1, method 1.

Soldering

The dip-solder pins may be soldered for 5 s in solder of max. 260 °C.

CHARACTERISTICS

Ignition voltage, first ignition, 25 lx	V_{ign}	< 165 V
Ignition delay, first ignition, $V_{\text{ba}} = 165$ V, 0 lx	T_d	< 0,5 s
Ignition voltage, subsequent ignitions within 10 ms	V_{ign}	< 145 V
Maintaining voltage		see graph
Extinction voltage	V_{ext}	≥ 120 V
Luminous intensity per segment		10 mcd/mA

LIMITING VALUES

Absolute maximum rating system

	segments	decimal points
Cathode current		
d.c.	max. 1,4 min. 0,9	max. 0,25 mA min. 0,1 mA
peak	max. 7	max. 1,1 mA
$T_{imp} \geq 0,4$ ms	min. 1,0	min. 0,1 mA
mean $T_{av} = \max. 25$ ms	max. 1,0	max. 0,2 mA
Voltage between any two segments and/or decimal points		max. 120 V
Ambient temperature		max. 100 °C* min. -50 °C**

RECOMMENDED OPERATING CONDITIONS

If the tube is used within its limiting values and according to the conditions below, a high-quality display is obtained even with the worst combination of parameters.

For many applications the worst parameter combination will not occur. In those cases the conditions recommended below may be changed which may result in a cheaper drive circuit. These changes should, however, only be made after consulting the tube manufacturer.

Static operation

Anode supply voltage

V_{ba}	max. 350 V
	min. 165 V

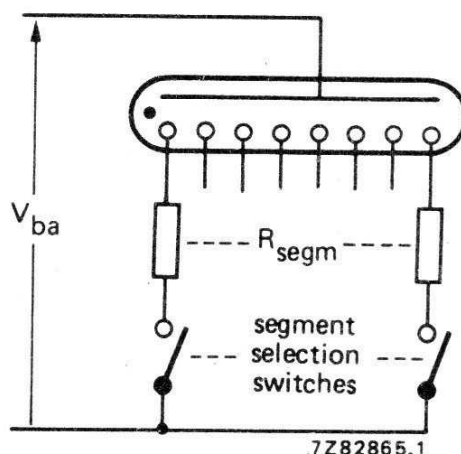


Fig. 1 Static operation.

* Bulb temperatures above 70 °C result in changes in colour.

** Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics.

Dynamic operation

Anode supply

V_{ba}	max.	350 V
	min.	165 V
$V_{ba \text{ off}}$	max.	125 V
	min.	115 V

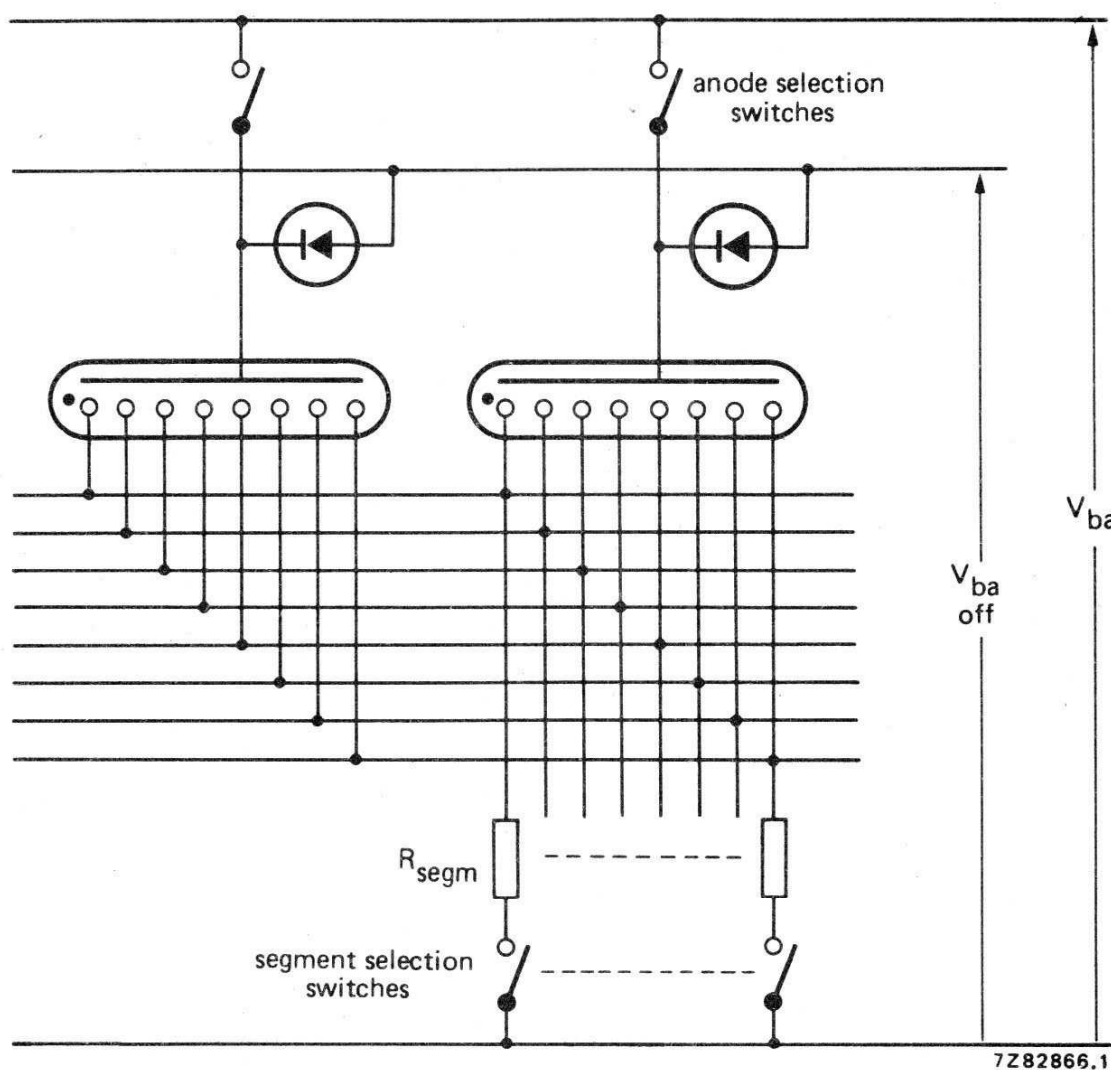


Fig. 2 Dynamic operation.

Shock and vibration

Samples are taken from the normal production line and are subjected to the following tests:

Shock: 50 g (peak), 1000 shocks in one of the three positions of the tube.

Vibration: (–1) 2,5 g (peak), –50 Hz for 2 hours.

(–2) 2,5 g (peak), –50 Hz for 96 hours (32 hours in each direction).

Acceptable quality level: 0,65.

Life expectancy > 50 000 h at 4 mA (peak) cathode current

End of life is reached when: (1) the light output is 50% below the initial output, or (2) the min. cover current is 10% higher than the initial min. cover current.

Life with respect to the min. cover current criterion may be reduced for segments not regularly activated. Please consult the manufacturer.

DIMENSIONS AND CONNECTIONS

Dimensions in mm

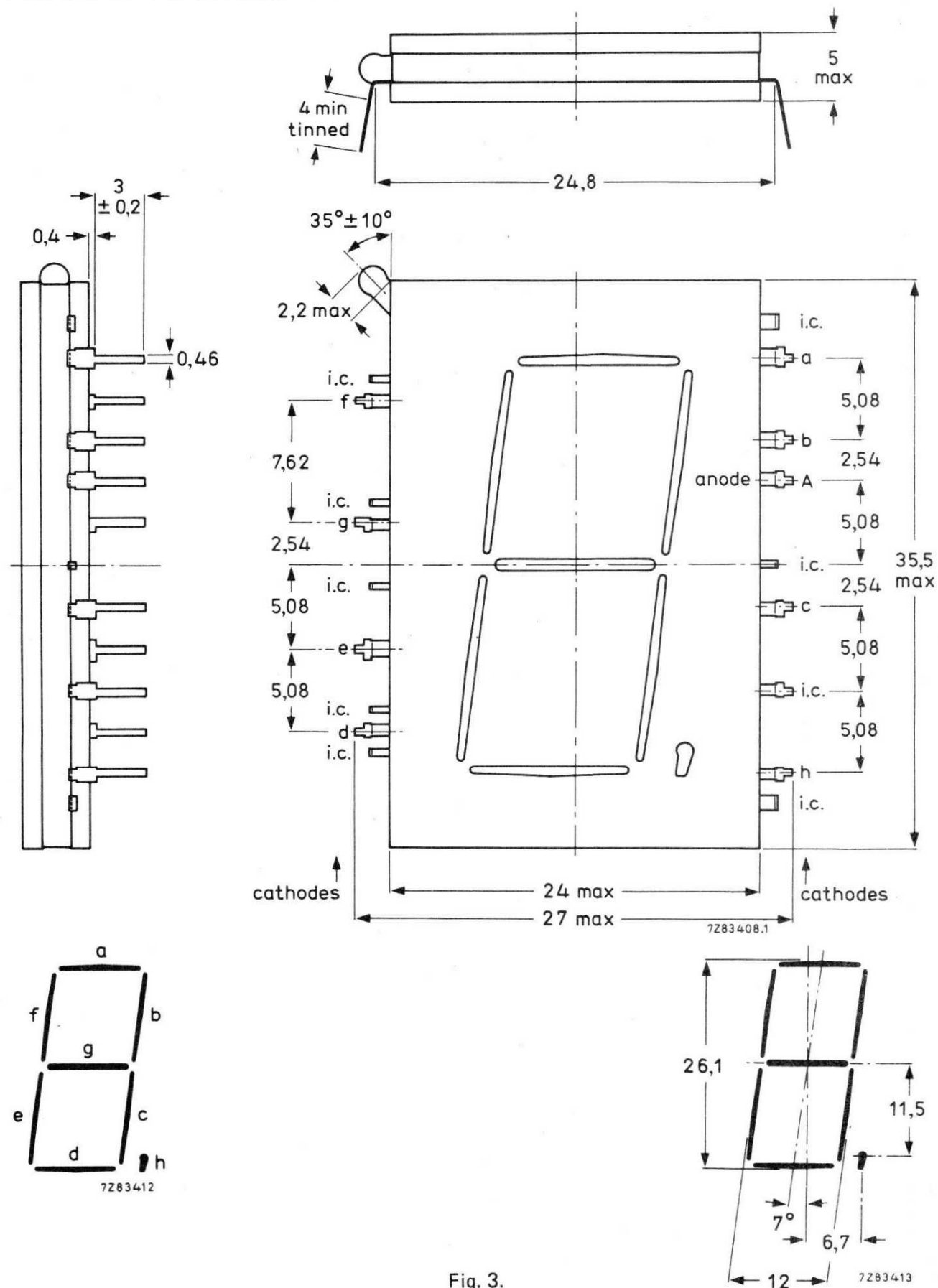


Fig. 3.

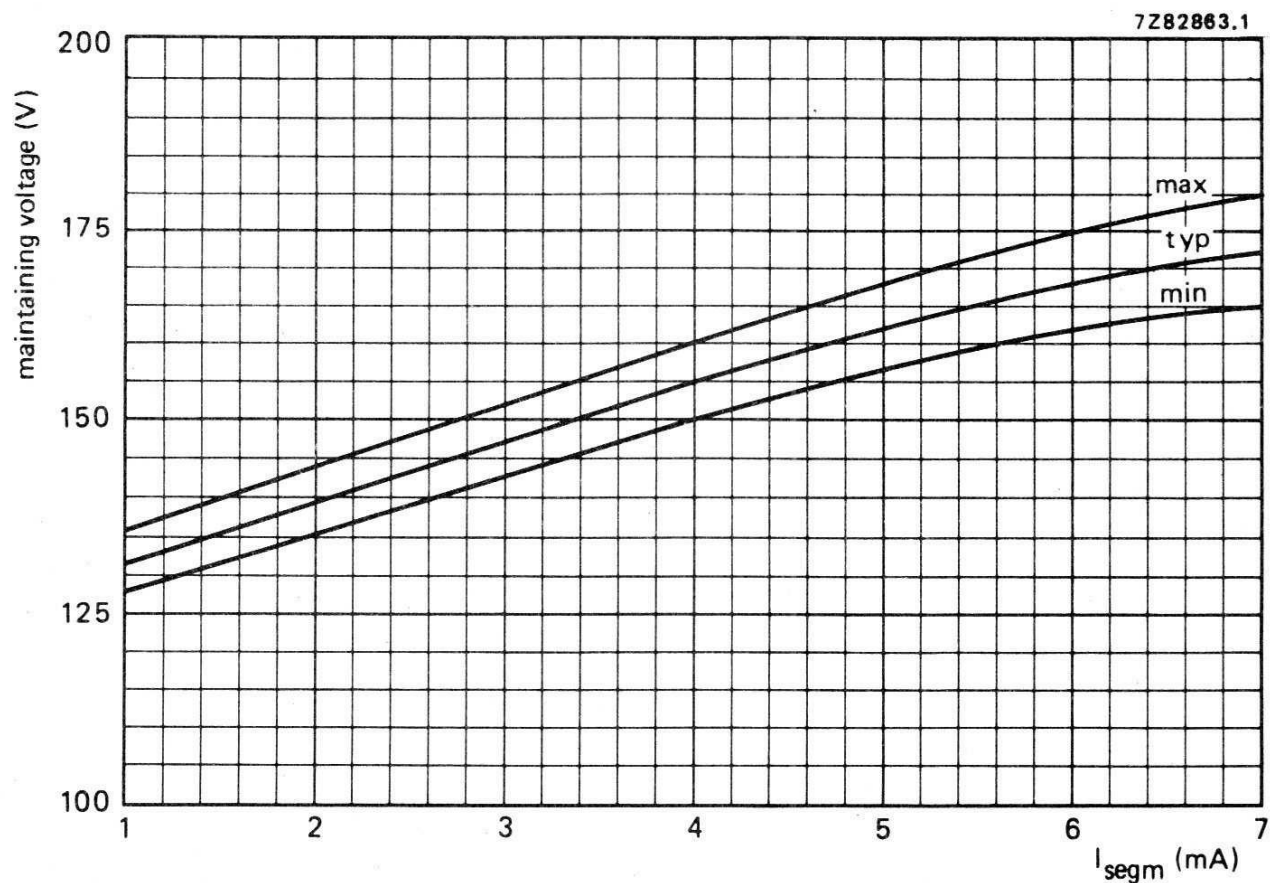


Fig. 4 Maintaining voltage as a function of segment current for segments a - g.

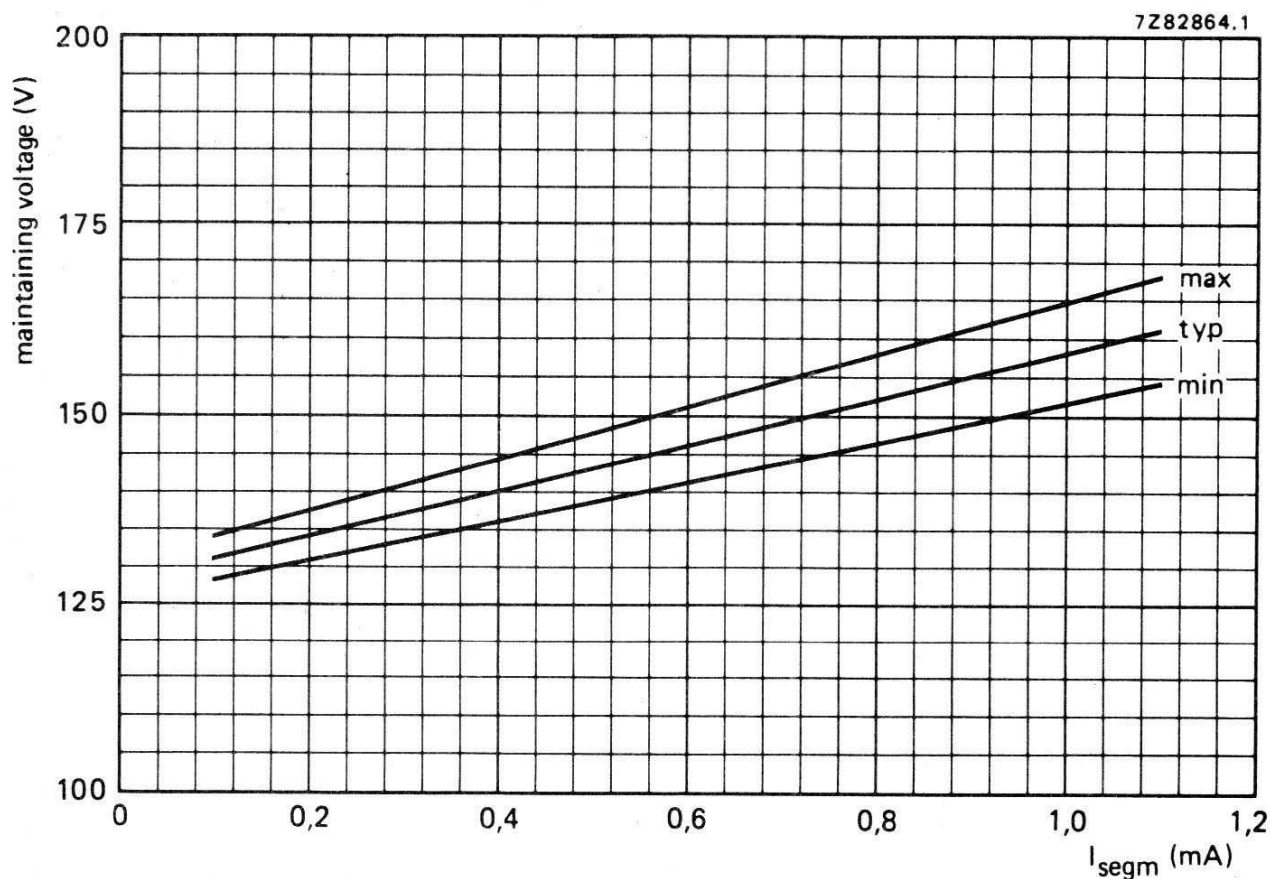


Fig. 5 Maintaining voltage as a function of segment current for decimal point.

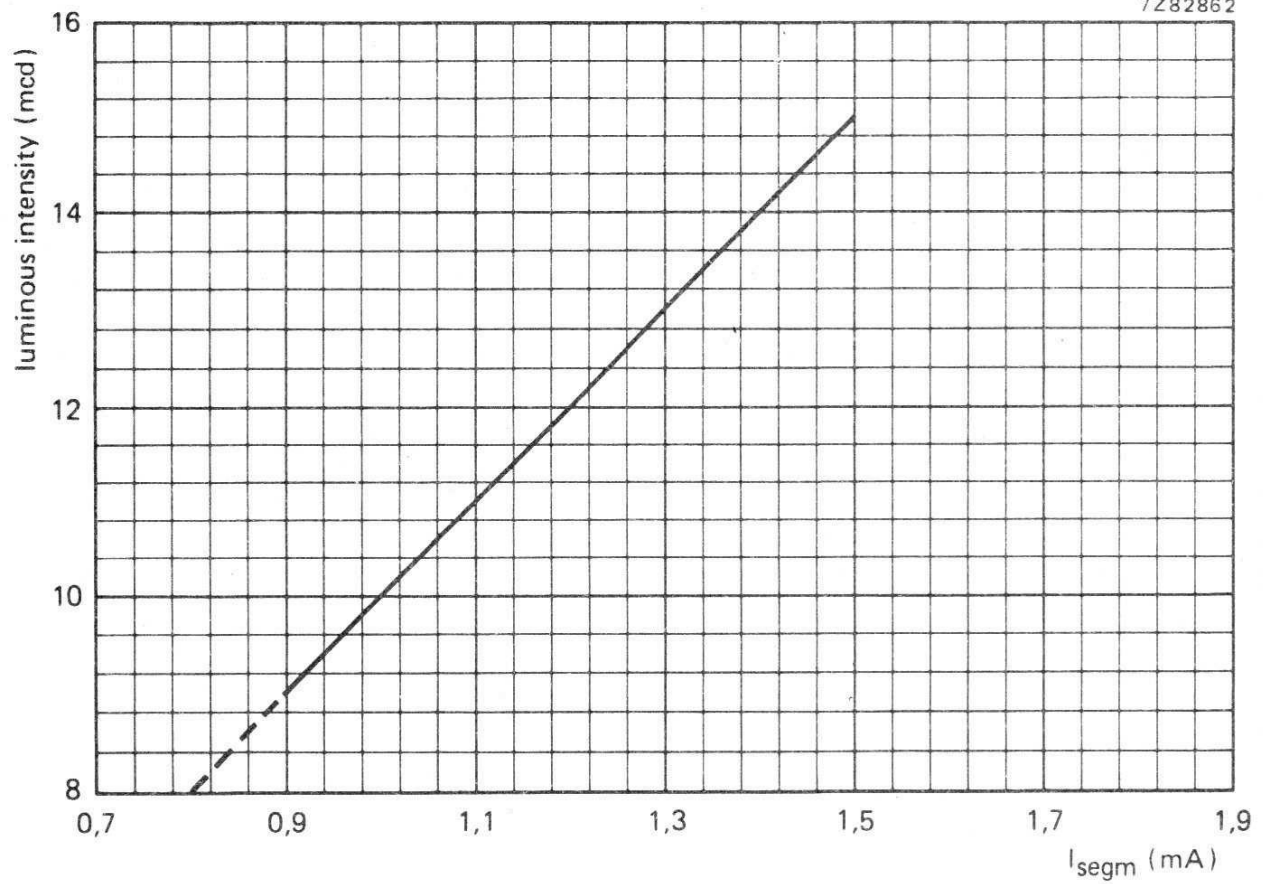


Fig. 6 Luminous intensity as a function of d.c. segment current.